DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING—P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO ATTENTION OF

CENCR-PD-R

UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM DEFINITE PROJECT REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-4)

ANDALUSIA REFUGE REHABILITATION AND ENHANCEMENT

POOL 16, MISSISSIPPI RIVER MILES 462 THROUGH 463

ROCK ISLAND COUNTY, ILLINOIS

JANUARY 1989

NCRCD-S-174020/12-02-88

09 Feb. 1989
CLEVENSTINE/386

ANDALUSIA REFUGE HREP

STATEMENT OF FINDINGS

I. Project Description.

A. This statement concerns a proposal by the Rock Island District, Corps of Engineers (NCR), to perform work pursuant to the Environmental Management Program (EMP) - Habitat Rehabilitation and Enhancement Program (HREP) at Andalusia Refuge, Rock Island County, Illinois. This work involves dredging, excavation, levee construction, concrete construction, electrical work, and rock placement.

B. An Environmental Assessment addressing effects of the proposed project has been prepared and circulated for public review, along with a Section 404(b)(1) Evaluation. This review was completed on 15 December, 1988. The Clean Water Act, Section 404 Public Notice for this project was issued 23 November, 1988.

II. Statutory Authorities and Administrative Determination.

A. I have reviewed and evaluated, in light of the overall public interest the documents and factors concerning this permit application, as well as the stated views of other interested Federal and non-Federal agencies and the concerned public.

B. The possible consequences of this proposed work have been studied in accordance with regulations published in 33 CFR Part 230 (Appendix B), 33 CFR Parts 320 to 340, 40 CFR Part 230 (if applicable), and 33 CFR Part 240 (Implementation of Executive Order 11988, Flood Plain Management).

III. Public Interest Review. The public notice issued for the project on 23 November, 1988 was sent to the following places: post offices; appropriate city and county officials; adjoining property owners; appropriate State and Federal agencies; local, regional, and national shipping entities; and other interested parties. A mailing list for the public notice is included in the permit application file. The following points are considered pertinent:

A. Federal Agencies (responding to the Environmental Assessment (EA))

1. Letter from the U.S. Department of Health and Human Services, dated November 22, 1988, stating concurrence with the findings of the report and that the described project will not pose extraordinary risks to public health or safety.

2. Letter from the U.S. Department of Agriculture, Soil Conservation Service, State Conservationist [Illinois], dated November 30, 1988, stating concerns for bottomland hardwood and wetland impacts; drainage of FSA wetlands; and increased sediment input to the Mississippi River.

3. Letter from the U.S. Fish and Wildlife Service (FWS), dated 02 December, 1988, stating that no negative impacts are anticipated and that the proposed project is compatible with the purposes for which the refuge was established.

4. Letter from the U.S. Department of the Interior, Bureau of Mines, dated 07 December, 1988, stating that no impacts to mineral resources are anticipated from the proposed work. This agency recommended inclusion of language to that effect in future project documentation. The purpose of that language is to indicate that mineral resources are considered during project planning.

5. Telephone conversation with the U.S. Geological Survey, dated 12-14-88, stating no comment on the project.

The only correspondence requiring response was number 2, above. By telephone conversation dated 09 January, 1989, Rock Island District staff reviewed project features with the SCS State Conservationist. Following this review, the SCS concerns presented in the November 30, 1988, letter were considered to have been adequately addressed and require no further action.

B. State Agencies (responding to the EA or project coordination letters).

1. Letter from State of Illinois, Historic Preservation Agency, dated November 28, 1988, providing a determination that no significant historic, architectural, or archaeological resources are located in the project area.

2. Letter from State of Illinois, Department of Agriculture, dated December 8, 1988, stating that the Department had completed review of the project and that the Department fully supports project implementation.

3. Letter from State of Illinois, Office of the Governor, dated December 18, 1988, stating that the Clearing House had begun review of the [project] and indicating a reply timeframe, during which no reply was received.

4. Letter from the State of Illinois, Department of Conservation, dated 21 Dec 1988, indicating no objection, and stating support for the project.

C. Federal Agencies (responding to the Section 404 Public Notice)

1. Letter from the U.S. Environmental Protection Agency, Region 5, dated December 12 1988, stating inability to review the project and requesting opportunity to review the project if unexpected adverse impact results from any [project] activities.

2. Letter from the U.S. Fish and Wildlife Service, dated 13 December, 1988, stating no objection to issuance of the related permits.

No other Federal agencies have responded to the public notice for this project.

D. State Agencies (responding to the Section 404 Public Notice and Section 401 certification application).

1. Letter from the State of Illinois, Department of Transportation, Division of Water Resources, dated 23 December, 1988, providing permit No. 19443.

2. Letter from the State of Illinois, Environmental Protection Agency, dated January 17, 1989, providing certification under Section 401 of the Clean Water Act, subject to the following conditions:

1. The applicant shall not cause:

a. violation of applicable water quality standards of the Illinois Pollution Control Board, Title 35, Subtitle C: Water Pollution Rules and Regulations;

b. water pollution as defined and prohibited by the Illinois Environmental Protection Act; and

c. interference with water use practices near public recreation areas or water supply intakes.

2. The applicant shall provide adequate planning and supervision during the project construction period for implementing construction methods, process and cleanup procedures necessary to prevent water pollution and control erosion.

3. Any spoil material excavated, dredging or otherwise produced must not be returned to the waterway but must be deposited in a self-contained area in compliance with all State statutes, regulations and permit requirements with no discharge to the waters of the State unless a permit has been issued by this Agency. Any back filling must be done with clean material and placed in a manner to prevent violation of applicable water quality standards.

4. All areas affected by construction shall be mulched and seeded as soon after construction as possible. The applicant shall undertake necessary measures and procedures to reduce erosion during construction. Interim measures to prevent erosion during construction shall be taken and may include the installation of staked straw bales, sedimentation basins and temporary mulching. All construction within the waterway shall be conducted during zero or low flow conditions.

5. The applicant shall implement erosion control measures consistent with the "Standards and Specifications for Soil Erosion and Sediment Control" (IEPA/WPC/87-012).

6. The channel relocation shall be constructed under dry conditions and stabilized to prevent erosion prior to the diversion of flow.

7. The erosion control plans and specifications for levee construction shall be submitted to the Agency for approval prior to construction.

8. This certification becomes effective when the Department of the Army, Corps

of Engineers, includes the above conditions #1 through 7 as conditions of the requested permit issued pursuant to Section 404 of PL. 95-217.

E. Individuals or Organized Groups.

1. Letter from the Illinois Duck and Goose Hunters Alliance, Inc., dated 13 December, 1988, stating support for the project.

2. Letter from Ronald Morrison, dated December 19, 1988, stating support for the project and expressing concern for land use and trespass on the refuge.

IV. Summary of Environmental Impact Review.

A. An Environmental Assessment (EA) has been prepared for the project. This review has not identified any potentially significant adverse effects under terms of the proposed activity. Thus, a Finding of No Significant Impact was prepared and is included in the EA.

B. The Section 404(b)(1) Evaluation prepared for this project concluded that the proposed activity will comply with the guidelines set forth in 40 CFR Part 230 with appropriate conditions as discussed in the evaluation document and this Statement of Findings.

V. Summary of Findings. I find that performance of the project under the conditions set forth, and as prescribed by regulations published in 33 CFR Part 230 (Appendix B), 33 CFR Parts 320 to 340, 40 CFR Part 230 (if applicable), and 33 CFR Part 250 (Implementation of Executive Order 11988, Flood Plain Management), is in the public interest.

Date

NEIL A. SMART
Colonel, Corps of Engineers
District Engineer

ACKNOWLEDGMENT

Primary study team personnel who are familiar with the technical aspects of the study are listed below:

PROJECT MANAGER: Andrew J. Bruzewicz

PROJECT ENGINEER: Daniel J. Holmes, P.E.

HYDRAULIC STUDIES: Leo Foley

SOCIO-ECONOMIC ANALYSIS: Patricia Risser

ENVIRONMENTAL STUDIES: Jon Duyvejonck

CULTURAL RESOURCES: Kenneth Barr

GEOTECHNICAL: Sibte Zaidi

LOCAL COOPERATION AGREEMENT: Martha J. Alford

STRUCTURAL DESIGN: Keith Wilson, P.E.

MECHANICAL AND ELECTRICAL: William Haman, P.E.

WATER QUALITY: Clint Beckert, Ph.D

EXECUTIVE SUMMARY

Andalusia Refuge and adjacent Dead Slough, located in Pool 16, are a 393-acre backwater complex approximately 1 mile north of Illinois City, Illinois. The proposed site is closed to hunting and located within the Upper Mississippi River Wildlife and Fish Refuge on General Plan lands made available to Illinois through cooperative agreements between the Corps of Engineers and the Department of Interior, and between the Department of Interior and the State. The refuge is managed by the Illinois Department of Conservation in accordance with an annual program submitted to the U.S. Fish and Wildlife Service as a National Wildlife Refuge within the meaning of Section 906(e) of the 1986 Water Resources Development Act.

Sedimentation from the Mississippi River and adjacent uplands has significantly impacted on the Andalusia Refuge and adjacent backwater fisheries. Migratory waterfowl already under stress due to drought conditions and loss of habitat in the Upper Midwest have been affected, and necessary deepwater fish habitat off the main channel has been reduced. Duck counts by the Illinois Department of Conservation show that the duck use days at the Refuge, an important link for waterfowl using the Mississippi flyway, are exceedingly low. Present peak waterfowl use days are less than 2,000. This compares to conditions at the next nearest refuges, where water levels can be controlled, at Lake Odessa (River Mile 437) and Princeton Refuge (River Mile 507). Peak use days at these refuges are as much as 50 times higher than Andalusia Refuge. Additionally, fish are trapped in adjacent sloughs when water levels fall in the late spring and die from low levels of dissolved oxygen, and, in some years, from the high summer water temperatures or winter freeze-outs caused by the almost complete absence of water.

Alternative locations in the floodplain between Lake Odessa and Princeton Refuge were considered. Pool 17 has very little potential for sites in the upper pool due to flood control levees close to each shoreline. The first suitable location is already occupied by the Big Timber Division of the Mark Twain National Wildlife Refuge (River Mile 444). Existing resource conditions at Big Timber do not lend themselves to the type of habitat improvement and modifications available for migratory waterfowl at the Andalusia Refuge. In Pool 16, Andalusia Island (River Mile 467) is less suitable due to the absence of land access and significantly higher construction costs necessitated by having to levee the entire perimeter and other design considerations. "Milan Bottoms" (River Mile 477) is not as suitable since land dedicated to new uses would involve significant loss of present wood duck and terrestrial habitat benefits. There are no suitable locations in Pool 15 due to intense development, and none in Pool 14 below the existing refuge at Princeton, Iowa.

Project objectives are to: enhance migratory waterfowl habitat by providing adequate vegetation and reliable loafing and resting areas; retard the loss of aquatic habitat by reducing sedimentation into the Refuge and Dead Slough; enhance aquatic habitat in Dead Slough by channel excavation and by providing year-round water access to the river.

The alternatives considered to accomplish the objectives included: variously sized moist soil management units (MSMU's); diversion of four adjacent watersheds supplying flow and sediment; river bank protection of the Refuge; various access channels and slough excavation configurations for Dead Slough; varying interior and side channel drainage excavation and associated island configurations within the MSMU; and various access road configurations to permit pump station and levee maintenance access. MSMU sizes considered ranged from a 130-acre area protected by a perimeter 2-year earthen levee approximately 6 feet high with a 12-foot crown to a 265-acre MSMU protected by levees corresponding to 5- and 10-year events with average heights of 9 and 11 feet, respectively. Watershed diversions considered all four watersheds and included diversion drainage lengths of 2,200 to 2,500 feet on private land which would require permanent easements or additional fee title. River bank protection would consist of crushed stone bedding with a riprap blanket to protect approximately 85 acres of emergent and submergent vegetation from possible Mississippi River erosion.

Dead Slough and access channel alternatives required locations where neither erosion nor deposition occurred and which were consistent with other project features, while allowing adequate material placement. Interior channels were necessary to facilitate drainage during drawdowns, hastening establishment of new vegetation, and to provide material for adjacent levee borrow. Interior material placement had to provide optimal island protection for waterfowl from foraging land animals. Access to the pump station alternatives required reliable all-year access, consideration of potential disruption of Refuge objectives due to unauthorized access, and clearing and ownership considerations.

The selected plan for the habitat project consists of constructing a 2-year event levee averaging approximately 6 feet high, 8,600 feet long with top widths of either 12 feet or 60 feet, providing water level control on 130 acres of agricultural land. Included are a pump station capable of pumping 3,500 gallons per minute into the Refuge and 5,000 gallons per minute from the Refuge, one gated water control structure, and an armored lower section of the levee to withstand overtopping of the levee without damage during floods. Mechanical excavation in Dead Slough to a depth approximately 9 feet below flat pool (about 110,000 cubic yards) and in the interior of the MSMU (about 75,000 cubic yards) will create approximately 3.1 miles of channel (10,900 feet within the MSMU and 5,600 feet within Dead Slough). Channel width within Dead Slough adjacent to the levee will be 60 feet at the base of the cut. The configuration of the dredged channel within the MSMU will create eight or more islands, totalling about 9 acres. These channels will enable fish to leave the MSMU through a water control structure into Dead Slough and then into the main channel. The new mouth of Dead Slough will empty into Scisco Chute. The intermittent stream now depositing sediment in Refuge backwaters will be redirected to Scisco Chute, decreasing the sedimentation rate in the Refuge and Dead Slough. The new channel will be 2,430 feet long and 3 feet deep with a 30-foot bottom width. It will be located on Government-owned land and will be capable of conveying a 2-year event within bank. The other three streams have no feasible rerouting alternatives and will be left unchanged. River bank erosion was determined to be insignificant, not threatening the stability of the bank or the interior portion of the Refuge. The recommended access

road consists of approximately 3,600 feet of a 12-foot-wide service road, which also will be used for placement of overhead poles for electric power supply. Illinois Department of Conservation personnel will control access to the road to minimize disturbance to the Refuge area.

Average annual operation and maintenance costs of the project are estimated to be $11,400. The U.S. Fish and Wildlife Service has agreed to ensure that operation and maintenance will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986.

The habitat project will create a reliable food supply for migratory waterfowl in the fall, enabling water level manipulation on 130 acres of wetland to enhance food production. With the ability to manage water levels, water usually would be drawn down in June for the germination of natural or aerially seeded plants benefitting waterfowl, such as smartweed or Japanese millet. Water levels would be raised as the plants grow, allowing the seed heads to remain above the water level. The levee will prevent 2-year flood events (which have occurred only twice during the 22 years of record for the management period) from destroying the food crop, significantly increasing the Refuge's capacity to provide food and refuge. The channel configuration within the MSMU will create 9 acres of island suitable for the nesting of Canada geese. Improvements within Dead Slough and reopening the access will provide improved water circulation, increased levels of dissolved oxygen, and a decrease in the rapid water temperature fluctuations which now occur. The relocated drainage channel will improve water quality in Dead Slough and in the MSMU, with the decreased sediment influx prolonging project life.

It is proposed that the following information be collected to evaluate performance of the project: summer and winter measurement of dissolved oxygen in Dead Slough; soundings of Dead Slough and fish access channel excavations; and sedimentation measurements within the MSMU. Waterfowl survey data, vegetation inventories, and fishery survey data from Dead Slough may be collected by other agencies but will not be used for project performance evaluation.

The District Engineer has reviewed the project outputs and determined that implementation of the identified plan is justified and in the Federal interest. The project area is managed as a National Wildlife Refuge within the meaning of Section 906(e) of the 1986 Water Resources Development Act. Therefore, approval for construction of the Andalusia Refuge habitat rehabilitation and enhancement project is recommended by the Rock Island District Engineer at a 100 percent Federal cost estimated to total $1,869,000. The District Engineer further recommends that funds in the amount of $24,000 be allocated as quickly as possible for the preparation of plans and specifications.

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT (R-4)

ANDALUSIA REFUGE
REHABILITATION AND ENHANCEMENT

POOL 16, MISSISSIPPI RIVER MILES 462 THROUGH 463

ROCK ISLAND COUNTY, ILLINOIS

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ANDALUSIA REFUGE
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POOL 16, MISSISSIPPI RIVER MILES 462 THROUGH 463

ROCK ISLAND COUNTY, ILLINOIS

1. INTRODUCTION.

a. Purpose. The purpose of this report is to present a detailed proposal for the rehabilitation and enhancement of Andalusia Refuge. This report provides planning, engineering, and sufficient construction details of the selected plan to allow final design and construction to proceed subsequent to approval of this document.

b. Resource Problems and Opportunities. Andalusia Refuge and adjacent Dead Slough is a 393-acre backwater complex located between Mississippi River miles 462 and 463 in Pool 16. The project, located in Rock Island County, Illinois, lies on the Illinois left bank of the Mississippi River across from Fairport, Iowa, and is also about 1 mile north of Illinois City, Illinois. The proposed project is located within the Upper Mississippi River Wildlife and Fish Refuge on General Plan lands owned by the U.S. Army Corps of Engineers. The site is managed by the Illinois Department of Conservation (IDOC) under authority of Cooperative Agreements with the U.S. Fish and Wildlife Service (USFWS) and the Corps of Engineers.

The IDOC manages the approximately 393-acre Refuge primarily as a feeding and resting area for waterfowl. At present, there is no water level control in the Refuge, which limits management capability in providing quality habitat for waterfowl. The portion of the Refuge south of Dead Slough is particularly shallow and frequently has little or no water during the fall waterfowl migration. Although waterfowl food, such as smartweed and arrowhead, is often present, the lack of water level control significantly decreases the Refuge's ability to support migratory waterfowl, which is its primary objective.

In addition, sediment originates from both the Mississippi River during flood events and adjacent watersheds. Sediment from the adjacent bluff-top watersheds enters the Refuge through several small streams that empty into the upper end of the Refuge. Sediments decrease the water volume in the Refuge. This sedimentation has caused a succession from a dominance of aquatic bed-palustrine wetlands to more emergent class plant species such as sedge, rice-cutgrass, and willow. Acquisition of water level control and channel dredging can compensate for this sedimentation and reserve the plant succession from terrestrial toward a more desirable aquatic and semi-aquatic (marsh) condition.

Measures to prevent sediment deposition from adjacent upland erosion include upland erosion control and/or diversion of adjacent watershed flows having heavy sediment loads from the project site. The principal measures to reduce river source sediment are diverting river flows or blocking flows through the area. Such measures would include use of natural tree buffers, construction of levee systems, or construction of deflection dikes.

The proposed project will fill an important gap in providing a reliable and much needed refuge for fall migratory waterfowl along the Upper Mississippi River. Between the Iowa Department of Natural Resources (DNR) Refuges at Princeton, Iowa (River Mile 507) and Lake Odessa, Iowa (River Mile 437), there are no other waterfowl refuges capable of water level control. Water level control is a necessary management tool for river refuges in order to provide a reliable food source for fall migrating waterfowl. Although natural waterfowl food sources (i.e., smartweed, arrowhead, wild celery, wild millet) are occasionally abundant when low summertime water levels occur, fall high water events frequently ruin their value to waterfowl. The construction of a Moist Soil Management Unit (MSMU) on the Andalusia Refuge (River Mile 462) will allow: (1) the reliable production of waterfowl food crops during summer months and (2) protection from loss due to fall flood events and optimization of water levels for waterfowl.

Construction of the levee required for the MSMU is also a unique opportunity to restore a backwater fishery habitat in Dead Slough that has been gradually lost due to sedimentation. The Andalusia Refuge overall has experienced sedimentation at an average rate of 0.5 inch/year since construction of the 9-foot channel. Dead Slough itself has experienced a rate closer to 0.8 inch/year due to pre-lock and dam deeper areas. Dead Slough is a backwater pond which becomes isolated from the main river at normal pool due to sedimentation at its mouth. Falling river water levels trap fish from flood events in the slough and cause fish kills when dissolved oxygen is depleted. The reconnection of Dead Slough to the main river will restore and enhance the fishery resources of that portion of the Refuge.

c. Scope of Study. The geographical scope of the study area is shown on plates 1 and 2. Emphasis was placed on developing project features which were located on existing State or Federal lands. Although additional land could be purchased by non-Federal interests, alternatives with land acquisition were not pursued due to policy, scheduling, and funding purposes. Alternatives involving upland erosion control were not studied in detail. The U.S. Soil Conservation Service has primary jurisdiction for these programs.

Field surveys were performed in developing sedimentation estimates, assessing effects near project boundaries and Government property lines, and estimating excavation/dredge quantities. Surveyed sections will be used to evaluate post-construction performance.

Soil borings were taken to assess sediment types, to verify foundations of proposed structures, and to determine excavation/dredging difficulty. Water quality sampling was initiated at the commencement of the study and will continue through construction.

Fish and waterfowl observations within the study area were made by the IDOC. These observations will assist in evaluating project performance.

d. Format of Report. The report is organized to follow a general problem solving format. The purpose and problems are presented in Section 1. Section 2 provides an overview of how and why Andalusia Refuge was selected as a project within the Environmental Management Program. Section 3 establishes the baseline for existing resources. Section 4 provides the objectives of the project. Sections 5 and 6 propose and evaluate project alternatives. Sections 7 and 8 describe the selected plan. Section 9 is an assessment of environmental effects from the proposed plan pursuant to the National Environmental Policy Act. Section 10 provides a summary of project accomplishments or benefits. Sections 11, 12, and 13 describe estimated operation and maintenance considerations, performance monitoring, and detailed cost estimates for both initial construction and annual operation and maintenance. Sections 14, 15, 16, and 17 provide a summary of implementation requirements and coordination. Sections 18, 19, and 20 present the conclusions, recommendations, and Finding of No Significant Impact.

Drawings (plates) have been furnished to provide sufficient detail to allow review of the existing features and the proposed plan. Plates 1, 2, and 3 show the project location, the recommended plan, and alternative plans. Plate 4 shows adjacent watersheds which were studied to evaluate adjacent sedimentation effects. Plates 5 and 6 provide 22 years of hydrographic record of the Mississippi River at the proposed project site. These hydrographs provide the relationship between river flood events and proposed levee heights. Plate 7 provides soil borings which were used to evaluate foundation effects and excavation/fill methods. Plates 8, 9, 10, 11, 12, and 14 provide plan views of the selected alternative. Plate 13 was included to show existing ground surfaces relative to river erosion effects. This plate, with accompanying monitoring plates of 23, 24, and 25, provides a basis for future monitoring ranges. Plates 15, 16, 17, 18, and 19 provide profiles and section views for the selected plan. Plates 20, 21, and 22 provide concept plans and details for the pump station and the water control plan.

e. Authority. The authority for this report is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). The proposed project would be funded and constructed under this authorization. Section 1103 is summarized as follows:

> Section 1103. UPPER MISSISSIPPI RIVER PLAN
>
> (a) (1) This section may be cited as the Upper Mississippi River Management Act of 1986.
>
> (2) To ensure the coordinated development and enhancement of the Upper Mississippi River System (UMR), it is hereby declared to be the intent of Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that this system provides a diversity of opportunities and

experiences. The system shall be administered and regulated in recognition of its several purposes.

(e) (1) The Secretary, in consultation with the Secretary of the Interior and the States of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, is authorized to undertake, as identified in the Master Plan -

(A) a program for the planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement...

2. GENERAL PROJECT SELECTION PROCESS.

a. Eligibility Criteria. A design memorandum (or implementation document) did not exist at the time of the enactment of Section 1103 of the Water Resources Development Act of 1986. Therefore, the North Central Division, U.S. Army Corps of Engineers, completed a "General Plan" for implementation of the Upper Mississippi River System-Environmental Management Program (UMRS-EMP) in January 1986. The USFWS, Region 3, and the five affected States (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) participated through the Upper Mississippi River Basin Association (UMRBA). Programmatic updates of the General Plan for budget planning and policy development are accomplished through Annual Addendums.

Coordination with the States and the USFWS during the preparation of the General Plan and Annual Addendums led to an examination of the Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Master Plan, completed by the Upper Mississippi River Basin Commission in 1981, was the basis of the recommendations enacted into law in Section 1103. The Master Plan report and the General Plan identified examples of potential habitat rehabilitation and enhancement techniques. Consideration of the Federal interest and Federal policies has resulted in the following conclusions:

(1) First Annual Addendum. The Master Plan report... and the authorizing legislation do not pose explicit constraints on the kinds of projects to be implemented under the UMRS-EMP. For habitat projects, the main eligibility criteria should be that a direct relationship should exist between the project and the central problem as defined by the Master Plan, i.e., the sedimentation of backwaters and side channels of the UMRS. Other criteria include geographic proximity to the river (for erosion control), other agency missions, and whether the condition is the result of deferred maintenance....

(2) Second Annual Addendum. The types of projects that are definitely within the realm of Corps of Engineers implementation authorities include the following:

- backwater dredging
- dike and levee construction
- island construction
- bank stabilization

- side channel openings/closures
- wing and closing dam modifications
- aeration and water control systems
- waterfowl nesting cover (as a complement to one of the other project types)
- acquisition of wildlife lands (for wetland restoration and protection.) Note: By letter of February 5, 1988, the Office of the Chief of Engineers directed that such projects not be pursued.

A number of innovative structural and nonstructural solutions which address human-induced impacts, particularly those related to navigation traffic and operation and maintenance of the navigation system, could result in significant long-term protection of UMRS habitat. Therefore, proposed projects which include such measures will not be categorically excluded from consideration, but the policy and technical feasibility of each of these measures will be investigated on a case-by-case basis and recommended only after consideration of system-wide effects.

b. Selection Process. Projects are nominated for inclusion in the Rock Island District's habitat projects program by the respective State conservation agencies and the USFWS based on agency management objectives. To assist in the project formulation process, the Fish and Wildlife Interagency Committee (FWIC), a group composed of State and Federal biologists who work at projects along the Mississippi River and Illinois Waterway, convened a series of meetings in 1986 to consider critical habitat needs along the Mississippi River. At these meetings, the available habitat was evaluated on a pool-by-pool basis. This analysis revealed deficiencies (such as feeding, resting, and loafing areas for migratory waterfowl, absence of deep water off the main channel for diving ducks, fish, etc.) as well as types of habitat in abundant supply (e.g., mature bottomland hardwood). With this information, projects being considered can most accurately reflect broader regional needs in addition to representing the best site-specific choices.

Rock Island District assists the State and the USFWS agencies proposing habitat projects through use of an in-house task force with members from the design, hydraulics, channel maintenance, environmental, and waterways planning branches. As projects are being conceptualized, this groups meets on-site with State and USFWS personnel to examine as fully as possible what site-specific benefits would be both desirable and engineeringly feasible.

As input to the District to assist in the final selection of projects to be included in the program, projects are ranked by the FWIC according to the biological benefits that they could provide. Each project is considered, and project alternatives to increase habitat benefits for fish, waterfowl, and other wildlife are suggested. Every project is ranked according to the benefits provided as high, medium, or low.

The FWIC rankings are forwarded to the District and to the River Resources Coordinating Team (RRCT), an interagency policy group which meets to coordinate Mississippi River activities. The RRCT examines the FWIC rankings and

includes consideration of the broader policy perspectives of the agencies submitting the projects. The RRCT-recommended rankings also are submitted to the District, and the District then formulates and submits a recommended program, which is consistent with the overall program objectives, to the EMP program manager at North Central Division.

Projects consequently have been screened by biologists closely acquainted with the rivers. Resource needs and deficiencies have been considered on a pool-by-pool basis to ensure that regional needs are being met and that the best expertise available is being used to optimize the habitat benefits created at the most suitable locations.

c. Specific Site Selection. Through the above selection process, Andalusia Refuge was recommended and supported as capable of providing high waterfowl and aquatic benefits if proposed project features were implemented. The site is located on existing federally owned lands and is locally known by the public as a closed refuge. Development at Andalusia Refuge would minimize land use changes and potential adverse public reactions.

Other floodplain and out-of-floodplain locations were evaluated within this reach of the river for potential waterfowl and aquatic enhancement benefits. Out-of-floodplain or upland (non-wetland) locations were considered not feasible for this project. The very nature of waterfowl and aquatic enhancement is wetland dependent and requires that it be constructed in a location with an abundant surface water supply immediately adjacent to the river.

Alternate locations to the Andalusia Refuge site (River Mile 462) within the floodplain were considered. In Pool 16, there are only two other locations where similar waterfowl water control measures could possibly be located: Andalusia Island and the "Milan Bottoms" near the mouth of the Rock River.

The Andalusia Island complex (River Mile 467) is very similar to the proposed project site. Its location being an island, however, would make management extremely difficult due to the lack of land access. Construction costs also would be significantly higher because a levee would be required on all sides.

The "Milan Bottoms" area is a large, several-hundred-acre forest-wetland complex (River Mile 477) that State biologists in the past have considered as having potential for waterfowl habitat development. This area has some of the best existing habitat in Pools 15 and 16 because of its diverse complex of wetlands, backwaters, and forest. The area already is extremely important reproductive habitat for wood ducks. But it would be difficult to achieve enough migratory habitat benefits to overcome the potential loss of reproductive habitat. Negative impacts to other wildlife increase the losses. The lack of a large, unforested expanse would require extensive clearing to achieve waterfowl benefits similar to those at the currently proposed location.

Pool 15 offers no possible locations due to its intensely developed nature, and Pool 14 offers no suitable locations until the existing refuge at Princeton, Iowa, (River Mile 507). Downstream, Pool 17 has very little

potential for sites in the upper part because of flood control levees close to each shoreline. The first suitable location is already occupied by the Lake Odessa, Iowa, Refuge (River Mile 437). The lack of suitable alternative sites emphasizes the importance of developing the existing Andalusia Refuge.

3. ASSESSMENT OF EXISTING RESOURCES.

a. Resource History. The Refuge area was principally a wooded area prior to the completion of Lock and Dam 16 at Muscatine, Iowa, in 1937. The present Dead Slough area was considered a lake in 1936, but once Pool 16 was formed, the area became a series of backwater channels, ponds, and lakes.

The U.S. Army Corps of Engineers acquired the acreage of the project site for navigational purposes prior to completion of the lock and dam. These lands are presently managed as part of the Upper Mississippi River Wildlife and Fish Refuge under terms of a Cooperative Agreement dated February 14, 1963, between the Department of the Army and the Department of Interior, and a subsequent Agreement between the Department of Interior and the IDOC.

b. Land Use. The Andalusia Waterfowl Refuge is managed by the IDOC. It is closed to all hunting from October 1 through December 31 every year in order to provide a feeding and resting area for migratory waterfowl. The Refuge (between River Miles 462-463) and surrounding habitat total approximately 393 acres. Based on aerial photographs taken in September 1984 and a 1982 IDOC vegetation survey, the composition of the Refuge is as presented in table 3-1.

The upper end of the Refuge has the highest elevation. This area receives a significant amount of sediment deposition from the small creek which is proposed for realignment and is now completely dominated by wet soil species such as sedge and rice cutgrass. Proceeding westward (downstream), the vegetation gradually changes toward more aquatic species such as arrowhead and bulrush, and eventually to submerged species such as coontail, pondweed, and star grass in deeper areas. Dead Slough has no deep, open water and is 100 percent composed of submergents such as coontail, curlyleaf pondweed, duckweed, and potamogeton. The mouth of Dead Slough is a vegetated mudflat dominated by willow and giant smartweed.

In contrast to the existing conditions, 1964 aerial photographs showed a refuge consisting predominantly of open water and woodland. Sedimentation was evident at the mouth of Dead Slough, but a channel was still contiguous with the main river at low water. At present, Dead Slough has no water exchange with the river except during floods. Several of the small, shallow backwater ponds and inlets within the Refuge have since succeeded to vegetated mudflats, willow thickets, or other persistent emergent wetland types.

TABLE 3-1

Andalusia Refuge Natural Resources 1/

Resource Type	Area, Acres
Wetland	
Palustrine	
Aquatic Bed	95
Emergent	102
Forested	196
Total Wetland	393

1/ Classification according to USFWS definitions.

c. Existing Fisheries Use. Dead Slough is an extremely shallow backwater slough of the Mississippi River. Maximum depth at an adjusted flat pool stage of 545.0 MSL (Fairport gauge) was approximately 1.5 feet in May of 1988 compared to the Plane Table survey of 1936 which showed mean depths of 6 feet from the same reference stage. The slough is virtually 100 percent vegetated during summer growing periods, with coontail, curlyleaf pondweed, and duckweed dominating the vegetation.

Fish populations in the slough are sporadic and stage-dependent. Severe summer and winter kills have been reported by both local residents and IDOC district wildlife biologists. These kills have been attributed to dissolved oxygen crashes brought on by high sediment oxygen demands and biological oxygen demands coupled with thermal stresses. The slough undoubtedly acts as an important fish refuge area during flood events and provides sport fishing opportunities during these periods. The slough also provides spawning and/or nursery habitat for fish species including carp, largemouth bass, black crappie, bluegill, smallmouth buffalo, and golden shiners. Other species collected in the area during a May 1988 sampling were shortnose gar, bowfin,

gizzard shad, and central mudminnow. Fish trapped in the area by receding water are subjected to extreme dissolved oxygen and temperature stress, often leading to the fish kills already discussed. Because of these conditions, the net fisheries value of this area is near zero or is negative. During spring and fall floods, the area has value, but this value is largely negated by subsequent fish kills.

d. Existing Waterfowl Use. Migratory waterfowl use of Andalusia Refuge is low, primarily due to its erratic food production for migratory waterfowl. The Refuge's present primary benefit is in providing a resting area (no hunting). Available food, such as duck potato, wild millet, and smartweed, varies annually according to water level fluctuations. Summer floods often prevent germination or growth of food plants, or late fall flood events often inundate good food crops under several feet of water. Active management of the Refuge is minimal since there is very little that can be done to significantly affect habitat quality for waterfowl. Censuses of waterfowl use in the Refuge indicate very low use compared to other waterfowl refuges in nearby pools that have water level management capability.

The aerial census information available for the Andalusia Refuge indicates that peak waterfowl use days probably has never exceeded 2,000. This is no better than other unmanaged locations in Pool 16. In comparison, the 348-acre refuge at Princeton, Iowa (Pool 14) had 100,000 duck use days for the 1987 fall migration and a peak day use of 15,000. Figures for other years are comparable.

e. Water Quality. The water quality of Dead Slough is poor. The shallow depth (maximum of 1.5 feet at flat pool) and lack of contiguity with the main river cause frequent oxygen depletion and increased temperature in summer and fall. Total fish kills are common following high water periods that leave fish stranded in the slough without any exit.

There is very little to no water in the refuge area proposed for levee protection. Most of the area consists of moist soil vegetation (reed canary grass, sedge, cattail, etc.) with water present only during spring and fall flooding.

Elutriate analyses showed only ammonia-nitrogen exceeding surface water quality standards. The effects of ammonia-nitrogen can be minimized by selecting appropriate construction methods and/or excavation/dredging during low temperature and pH seasons of the year.

f. Endangered Species. The following federally endangered species are listed as being historically or currently present in Rock Island County:

Indiana bat	Myotis sodalis
Bald eagle	Haliaeetus leucocephalus
Higgins' eye pearly mussel	Lampsilis higginsi
Fat pocketbook	Potamilus capax

None of these species has been observed or documented on the project, except for periodic use by bald eagles during late fall and early winter.

g. Cultural Resources. The proposed project levee alignment will impact a natural levee. Both the proposed stream diversion channel and access road crosscut alluvial fans. Previous investigations in the Mississippi River floodplain indicate that natural levees have a moderate potential for containing archeological deposits, while alluvial fans have been found to have much higher potential for containing intact buried archeological deposits. Previous archeological surveys conducted in the Mississippi River Pool 16 area have documented archeological sites dating from the Archaic period, 8,000 years ago, to the Woodland period, 900 years ago. None of the proposed project area had been previously examined for historic properties

h. Adjacent Water Projects. The proposed Andalusia Refuge project is adjacent to the Mississippi River 9-Foot Channel, as authorized by the Rivers and Harbors Act of July 3, 1930. Proposed project features of this report will not affect navigation.

i. Sedimentation. A sedimentation study was conducted to evaluate sedimentation in Dead Slough and in the Refuge area during the period 1936 through 1987. The average sedimentation rate for the entire area has been 0.5 inch/year. The average rate for Dead Slough has been approximately 0.8 inch/year.

The two predominant sedimentation sources are the Mississippi River and adjacent upland erosion. A comparison of river versus upland erosion is presented in table 3-2, along with potential sediment reductions due to the proposed project.

TABLE 3-2

Comparison of River Versus Upland Erosion Sedimentation

Sedimentation Source	Existing Conditions		Sedimentation Reduction Due to Proposed Project	
	Ac-Ft/Yr	%	Ac-Ft/Yr	%
Adjacent Watershed	11.0	64.7	4.2	24.7 a/
River	6.0	35.3	0.0	0.0
Net	17.0	100.0	4.2	24.7

a/ (17.0 - 4.2) ÷ 17.0 = .247

4. PROJECT OBJECTIVES. The project goals, objectives and enhancement potential are outlined in table 4-1.

TABLE 4-1

Project Goals and Objectives

Goals	Objective	Unit of Measure	Enhancement Potential	
			Existing	Target
Enhance Migratory Waterfowl Habitat	Increase reliable food production area (moist soil species)	Acres	0	130
	Increase reliable resting and feeding water area	Acres	0	200
Enhance Aquatic Habitat	Restore deep (6 ft) aquatic habitat	Acre-Feet	0	40
	Restore lentic-lotic habitat access cross-sectional area	Square Feet	0	180 (minimum)
	Improve dissolved oxygen concentration during critical seasonal stress periods	mg/l	<4.0 mg/l (winter/ summerkill of fish indicates extended periods of D.O. deficits)	>4.0 mg/l
Reduce Sedimentation in Refuge	Decrease adjacent tributary sediment volume	Acre-Feet/ Year	11	4.2

5. ALTERNATIVES.

a. Alternative A - No Federal Action. No Federal action would consist of no Federal funds being provided to meet the project purposes. State and local funds would be required to restore and enhance aquatic habitat.

b. Alternative B - 130-Acre MSMU Protected by 2-Year Levee. This plan consists of the construction of an approximate 130-acre MSMU protected by a perimeter 2-year earthen levee. The unit would consist of a perimeter levee approximately 8,600 feet in length tying into adjacent high ground on the south, as shown on plate 2. The MSMU area would be supported by a permanent pump station and water control structure. The pump station would have the capability of pumping from the MSMU during dewatering to the Mississippi River and also would be able to pump from the Mississippi River to the MSMU for additional inundation during migratory periods.

The general operating scenario for this alternative would consist of dewatering the unit commencing in June of each year (or as soon as possible following spring floods) and maintaining a dewatered condition through July and August. During this dewatered time, natural vegetation would emerge and/or seeds would be planted which would best support migrating waterfowl. Once either planted seeds or natural vegetation occurs, water levels would be allowed to increase within the unit by gravity flow. After water levels and vegetation within the unit reach adjacent river level, additional water would be pumped from the river into the unit during September and October. The pumping of additional water would utilize the full capacity of the MSMU for migratory waterfowl.

The 2-year event levee would be approximately 6 feet high with a minimum 12-foot crown and typical sections as shown on plates 18 and 19. Because this is only a 2-year event levee, provisions are necessary to allow overflow to occur without significant annual maintenance.

Overflow of the levee would occur by means of a riprap-protected section, as shown on plate 12, and by use of the gates on both the water control structure and the pump station.

c. Alternative C - Other MSMU Sizes. Additional sizes of MSMU's within the study area also were considered, as shown on plate 3. An additional 90 acres of unit could be achieved by extending the levee system down river by about 3,000 feet, as shown.

Approximately 65 additional acres also could be added by extending the perimeter system around Dead Slough, as shown on plate 3. Water levels within Dead Slough and the Refuge would be controlled by a similar pump station and water control structure, as discussed in Alternative B.

d. Alternative D - MSMU Protected by Higher Levees. Higher levees to protect the MSMU also were studied, and levee heights corresponding to 5- and 10-year event frequencies were evaluated. These levees would consist of the

same features as described in Alternative B, but would have approximate average levee heights of 9 feet and 11 feet for the 5- and 10-year events, respectively.

e. Alternative E - Adjacent Watershed Flow and Sediment Diversion. Adjacent watersheds with corresponding tributary drainage areas are shown on plate 4. Sediment from watersheds A, B, and C enters the project site with no practical alternative for diversion. Sediment from watershed D enters the project site and may be diverted.

Proposed diversion of sediment from watershed D consists of the construction of a diversion drainage ditch, as shown on plate 3. The diversion ditch is located on Government property and adequately intercepts all flows from this watershed and diverts them directly to Scisco Chute. The diversion ditch consists of a trapezoidal-shaped excavated channel approximately 30 feet wide at the bottom and approximately 2,430 feet long.

An alternative location for the diversion drainage ditch would consist of a ditch located as shown on plate 3. This ditch would require a permanent easement or fee title to lands off Government property. This alternative location would consist of the same typical section and would be approximately 2,200 feet long. This alternative location was not pursued due to additional land acquisition and comparable costs.

f. Alternative F - Refuge Bank Protection. River bank protection from Mississippi River flood events also was studied, as shown on plate 3. This protection would consist of 6 inches of crushed stone bedding with an 18-inch riprap blanket approximately 2,600 feet long. The intended purpose of this bank stabilization is to protect approximately 85 acres of emergent and submergent vegetation, as shown, from possible Mississippi River erosion.

g. Alternative G - Dead Slough Aquatic Improvement. This alternative consists of excavating an access channel to Dead Slough and adjacent channel excavation to the levee for improved habitat volume and quality. The improved areas should be deep enough to allow fish to winter and also to allow for future Dead Slough sedimentation. Various configurations of access and slough excavation were considered, as shown on plate 3. The mouth of the new access channel should be located in a zone which neither erodes nor exhibits sedimentation. Excavation within Dead Slough should be compatible with other project features to allow adequate material placement. The estimated length of the Dead Slough aquatic improvement is 5,600 feet.

h. Alternative H - Refuge Drainage/Island Construction. This alternative consists of the construction of interior and side channel drainage channels with associated islands, as shown on plate 2. Interior drainage channels approximately 8,600 feet long and 50 feet wide would facilitate drainage during pump station drawdowns and hasten establishment of new vegetation. Material excavated from the interior drainage channels would be placed to construct about 9 acres of islands which would serve as island refuge to waterfowl from land-based foraging animals.

The interior side channel would be constructed for adjacent levee borrow purposes, would assist in interior drainage during drawdown, and would provide a pool for aquatic habitat during the drawdown period. The total length of this channel would be approximately 2,300 feet, with a 20-foot bottom width. A portion of this channel, 600 feet in length, would be about 6 feet deep during drawdown.

6. EVALUATION OF ALTERNATIVES.

Alternative A, No Federal Action, would not meet project objectives of enhancing migratory waterfowl by providing resting/food support areas or improving or stabilizing aquatic habitat from further sedimentation degradation. Fish kills would continue to occur in Dead Slough when water levels fall, trapping fish without egress to the river. Benefits to waterfowl would continue to fluctuate erratically, depending upon the season and frequency of flood events. Even this marginal waterfowl habitat would gradually decrease as aquatic habitat succeeds toward a more terrestrial cover type. Up to 14 acres of bottomland hardwood would be saved directly if the levee and relocated drainage channel were not constructed. Approximately 18 acres of emergent/submergent wetland would not be converted to deep aquatic habitat. The leveed area would remain contiguous to the main river with no levee to affect fish movement into flooded vegetation.

Alternative B, 130-Acre MSMU Protected by a 2-Year Levee, would allow initial construction and operation to occur on existing Government lands and provides other aquatic improvement opportunities within Dead Slough. The inclusion of the additional 90 acres, as shown on plate 3, by extending the levee system downriver approximately 3,000 feet was not selected due to negative impacts on existing aquatic conditions. This area is recognized as a valuable submergent/emergent vegetative zone and is a desirable backwater feature.

In Alternative C, different MSMU sizes were evaluated. Enlarging the size of the leveed area would increase the number of waterfowl the area could support. Waterfowl gains, however, must be weighed against fishery losses. The levee boundary was determined to be the best location to provide the maximum benefit to waterfowl and fishery resources. Extending the levee north of Dead Slough would negate any fishery benefits that would result from the dredging of Dead Slough. It also could conceivably cause a significant increase in cost, since the levee would be adjacent to the main river channel and hence would require more protection from erosion. Extending the levee westward would place the levee in more open water and would necessitate a much longer tie-back to higher ground. In addition to the loss of fishery habitat, there would likely be a significantly higher cost to maintain the levee section in open water.

An alternative alignment which placed the levee on the north side of Dead Slough also was considered. This alternative would increase the MSMU by approximately 65 acres, but would greatly diminish fishery benefits from the dredging of Dead Slough.

In Alternative D, higher levee heights were considered. River events exceeding a 2-year frequency level during the months of June through December were studied. Out of 22 years of record, only 2 events exceeded a 2-year

elevation during these months of MSMU operation. One of these events occurred in June following a long spring flood. Monthly elevation-duration analyses also were performed for the normal operating months of June through December. Elevation 550.8 is exceeded 1 percent and 2 percent of the time for the months of June and October, respectively. Elevation 550.8 was not reached for the months of July, August, September, November, and December. This overtopping rate is acceptable, given the nature of the project and management objectives. Easements or property from abutting private landowners also would be required since the Corps has flood easements up to only the 2-year event. A 5-year levee could be used to keep floodwaters out, but water levels inside the levee could not be raised higher than elevation 550.8 without acquiring additional flood easements.

In Alternative E, diversion of flows and sediment was evaluated for all adjacent watersheds. Diversion of flows with associated sediment from watershed D was the only practical alternative. Flows from watersheds A, B, and C empty directly into the project site and would require miles of drainage ditches and channel relocations. However, areas where watersheds A, B, and C empty into the project site have natural alluvial fans with established semi-mature timber stands and low-level brush. These areas effectively settle and entrap much of the sediment from upland erosion before they reach Andalusia backwater areas. Should monitoring efforts after construction of the proposed project reveal substantial sediment inflow due to adjacent watersheds A, B, or C, coordination with appropriate soil conservation agencies should be effected to initiate upland erosion control programs.

In Alternative F, refuge bank protection was studied. During efforts to ensure that the downstream portion of the Refuge area would remain protected from Mississippi River flows, bank stabilization was proposed, as shown on plate 3. Field survey sections were taken and compared with 1936 topographic maps to determine relative movement of the bank line in protecting this area. These sections are shown on plates 24 and 25. It was concluded that this entire reach is not subject to river channel erosion. Shallow water depths of approximately 2 to 3 feet at flat pool are present throughout the entire reach. However, towboat propeller wash and wind-generated waves have contributed to tree line erosion with minor bank effects.

Comparison of the present survey sections with the 1936 elevations indicated that the substantial initial investment and recurring maintenance costs were not justified by providing bank stabilization in this reach. Furthermore, a closure dam located down river at approximately river mile 461.2 effectively blocks Drury Slough from direct flows and indirectly provides additional stability to the left bank within the project site.

Alternative G consists of the improvement of the Dead Slough area for fishery purposes. One of the critical features of the improvement consists of a channel for fish access into the Dead Slough area that would be open all year. The opening of the channel required location in a sediment-free and erosion-free zone. Areas on plate 3 were studied as possible alternatives to the new channel. One location consisted of a natural flow area as shown. However, there is only about 2 to 3 feet of water in the river adjacent to this site for about 300 feet. Additionally, the bottom of this zone consists of several

feet of soft sediments, indicating sediment deposition and questionable side slope stability during excavation and subsequent maintenance.

An additional mouth location also was studied, as shown on plate 3. The location of this proposed mouth could possibly increase sedimentation to the backwater refuge area by allowing uncontrolled entry of river flows into the upper end of the backwater area where such flows presently do not exist. The construction of the associated access channel from this point to the levee itself also could clear a desired natural buffer zone of mature trees which lies adjacent to the river. Clearing of this natural buffer would segment this portion of the refuge and possibly allow increased sedimentation in the backwater refuge area. These additional flows would create maintenance considerations by causing possible erosional scour against the new levee system, as well. Approximately 400 feet lies between the existing bank and main river channel, with only 3 feet of water clearance over a firm sand bottom. This condition would become a blockage to aquatic habitat during low flow, ice conditions. Excavation of a deeper channel in this vicinity also would encourage accelerated sedimentation in the mouth of the channel itself during Mississippi River high water events.

The location for the mouth of the access channel was selected as shown on plate 2. This location lies at the lower end of Scisco Chute and consists of an overland cut of about 400 feet. The entire Scisco Chute is a stable channel relative to sedimentation and scour and maintains minimum water depths from flat pool of 6 to 8 feet throughout the entire reach. Other evidence of erosion, such as downed bank trees, or sedimentation, such as sand or mud bars, is not present. Loss of the timber habitat is considered acceptable relative to the other negatives of considered alternatives. This access channel would provide deep water and reliable year-round fish access to the Dead Slough area.

Additional aquatic improvement also is proposed by means of excavation adjacent to the proposed levee, as shown on plate 2. This excavation would improve fish access to the Dead Slough area and provide additional deep water. Material from this excavation can be placed, as shown on plate 18, at the slough's edge to increase the section of the perimeter levee in this reach.

In Alternative H, interior improvements to the proposed MSMU were evaluated. Construction of drainage channels within the refuge itself was considered necessary to ensure adequate drainage to the pump station during drawdown periods. Without such drainage channels, water from the refuge would not reach the station in a timely manner, thus precluding efficient vegetation establishment during drawdowns. Material excavated from these ditches would be placed adjacent to the excavation zones and would create island habitat for additional refuge protection from land-based animals. These islands would be constructed as shown on plate 2. Construction of islands was considered a management objective to provide island-based refuge for migratory waterfowl.

Additional excavation within the MSMU, as shown on plate 2, would both provide a source of levee borrow and function as a low-water pool for survival of aquatic life.

7. SELECTED PLAN WITH DETAILED DESCRIPTION.

a. General Description. Alternatives B, E, G, and H were selected to be recommended for project construction. The construction of the 130-acre MSMU protected by a 2-year levee (Alternative B), selection of adjacent watershed flow and sediment diversion (Alternative E), Dead Slough aquatic improvement (Alternative G), and refuge drainage/island construction (Alternative H) all meet program objectives and are consistent with program funding. This plan further provides balanced waterfowl habitat improvement and aquatic fishery habitat improvement.

The proposed project consists primarily of the construction of a 2-year event levee (elevation 550.8 MSL), 8,600 feet long and up to 110 feet wide from toe to toe, which will provide water level control on 130 acres of Refuge land, and a pump station capable of pumping 3,500 gallons per minute into the Refuge and 5,000 gallons per minute from the Refuge. Fill material for the levee will be excavated from Dead Slough, from the interior of the newly leveed Refuge, and from the diversion drainage ditch. This construction will create approximately 3.1 miles of channel (10,900 feet within the Refuge and 5,600 feet within Dead Slough). (See plates 9-12.) The Dead Slough channel adjacent to the levee will have a 60-foot bottom width. The configuration of the excavated channels within the leveed area will create islands totalling approximately 9 acres. These channels will allow fish to exit the leveed Refuge through a new water control structure into Dead Slough, and eventually the main river. The new mouth of Dead Slough will now empty into Scisco Chute. These channels also will facilitate the drawdown of water levels in the Refuge. The water control structure will be placed in the upstream portion of the levee to provide improved water level management, as well as permit fish egress and ingress to the levee interior.

The intermittent stream which now deposits sediment in the refuge backwaters will be rerouted directly to the main river (Scisco Chute). This will significantly decrease the sedimentation rate in the refuge and Dead Slough and will prolong the habitat life of the newly dredged channels and leveed area. Effects from increased sedimentation in Scisco Chute and downstream river areas are expected to be negligible. The new excavated channel will be 2,430 feet long and 3 feet deep, with a 30-fooc bottom width. This action will require clearing 3.7 acres of timber and excavating 11,700 cubic yards of material.

The levee has only been designed for the 2-year event. This level of protection will be sufficient to provide water level control for approximately 21 years out of 22, which is considered good for an MSMU. The levee elevation has been designed to withstand frequent overtopping without extensive damage. The lower portion of the levee will be armored to protect it from overflow during floods.

Dredging will be accomplished by mechanical means (i.e., backhoe or clamshell). In order for the mechanical equipment to operate, some trees along the immediate shoreline must be cleared. Approximately 7.4 acres of woodland and 2.5 acres of submergent/emergent wetland will be lost in a 40- to

100-foot-wide path along the Refuge's perimeter levee. The equipment for dredging Dead Slough also will operate along the levee alignment or from floating barges in Dead Slough.

A new access road approximately 3,600 feet long and an electrical transmission line also will be constructed, as shown on plate 14. These will follow the government property line from the pump station to a county road which abuts Corps land just outside the project site. About 2 acres of timber will be cleared for this access.

b. Perimeter Levee. The entire perimeter levee is designed to prevent a Mississippi River 2-year flood event from entering the Refuge. The 2-year flood elevation for the project site is elevation 550.8 feet MSL, which represents the elevation of the overflow reach of the levee as shown on plate 12 from station 24+17CE to station 30+17CE (600 feet). From station 24+17CE to station 9+40 (see profile on plate 15), the profile of the levee is approximately five times steeper than the natural flood profiles of the Mississippi River. The profile of the levee in this manner will ensure that the leveed system will be filled from the lower end by river events that exceed 2-year events. This profile should provide minimal maintenance to the levee in this reach. A detailed description of the operational features of the levee system is presented in Section 11.

(1) Station 12+21C to Station 11+00. This reach of levee, as shown on plate 8, consists of a 12-foot-wide crown with an approximate height of 4 feet. Typical section is shown on plate 18. Borrow for this approximately 1,300 feet of levee will come from excavation of the nearby diversion drainage ditch and from Dead Slough excavation.

(2) Station 11+00 to Station 8+00CE. This reach of levee of about 4,100 feet consists of an approximate 60-foot-wide levee crown with 4:1 (Horizontal:Vertical) side slopes, as shown in plan on plates 9, 10, and 11 and with typical section on plate 18.

Through detailed on-site meetings and investigations, this reach of the levee has been located adjacent to Dead Slough such that approximately 40 feet of the levee section lies on existing ground above flat pool (elevation 545.0) with the remainder of the levee section lying within Dead Slough on land below flat pool (average elevation 544.0). This reach of the levee system has a substantially thicker section due to the placement requirement of adjacent Dead Slough excavation. The average height of this levee is 6 feet.

After construction, about half of the levee on the slough side will not require maintenance. The other half of this levee section will become the integral core of the levee and will require annual inspection and maintenance.

(3) Station 9+00CE to Station 24+17CE. This reach of the levee consists of approximately 1,600 lineal feet and has an average height of about 6 feet with 4:1 side slopes. This reach would be constructed using adjacent borrow sources, as shown on plates 12 and 13, with typical section on plate 18. The width of the levee crown of this reach will be 12 feet.

(4) Station 24+17CE to Station 30+17CE. This reach of the levee consists of approximately 600 feet crossing the most downstream area of the MSMU. Average height of this levee will be about 7 feet, with a 12-foot clay core and a 2-foot bedding and riprap blanket on the exterior for overflow and wave protection. This reach is shown on plate 12, with typical section on plate 18.

Borrow for this section of levee will be obtained from adjacent in-water excavation. Typical side slopes will be 4:1 due to construction considerations of the adjacent borrow.

(5) Station 30+17CE to Station 34+50CE. This 450-foot reach of the levee is shown on plate 12, with typical section on plate 19. This section of levee will tie into high ground and will be connected to the access road. Average height in this reach will be approximately 2 feet. Borrow will be obtained from areas adjacent to the access road.

c. Diversion Drainage Ditch. The plan view of the diversion ditch is shown on plate 8, with section shown on plate 18. The bottom width of the excavated ditch will be approximately 30 feet, with average depth of excavation of 3 feet. The drainage ditch has been sized to pass a 2-year precipitation event within bank.

The outlet of the diversion drainage ditch has been placed near flat pool in Scisco Chute which closely approximates the existing outlet and which should provide a maintenance-free outlet area.

The entire drainage diversion ditch is located on existing Government lands, so no additional easements/fee taking will be required. As shown on the typical section, an additional 10-foot-wide unsurfaced maintenance access service road also will be built during construction and used for maintenance after construction.

d. Dead Slough Excavation. As shown on plates 9, 10, and 11, with typical sections on plate 18, it is proposed to excavate approximately 110,000 cubic yards for Dead Slough aquatic improvement. The average bottom width of this excavation will be about 60 feet to elevation 536 MSL adjacent to the levee. The average cut for this excavation will be approximately 7 feet. This material will be placed in the levee section adjacent to Dead Slough, as described in the above perimeter levee, from station 11+00 to station 8+00CE.

An additional river access channel also will be constructed from Scisco Chute to the Dead Slough area. The approximately 1,100 feet of excavation will consist of a 30-foot-wide cut with an approximate 9-foot depth to elevation 536 MSL, with excavated material placed on adjacent land between stations 8E to 13E, as shown in section on plate 19.

e. Refuge Drainage/Islands. Interior Refuge drainage will be provided by the construction of excavated channels, as shown on plates 9, 10, 11, and 12. Two types of typical sections will be constructed as shown on plate 19.

Type I will consist of drainage channels constructed on both sides of an island. The excavated material would produce an approximate 45-foot-wide island at elevation 551 feet MSL.

Type II refuge excavation will consist of the drainage channel constructed on one side of the excavation with excavated material producing an approximate 10-foot-wide island with an elevation of 551 feet MSL. The overall length of the refuge drainage excavation will be about 8,600 feet. The profile of the refuge drainage excavation is shown on plate 17.

f. Pump Station. The pump station has been sized to evacuate the MSMU in approximately 14 days. This timeframe is considered acceptable for slow drawdown conditions and is consistent with management objectives. Plan views and typical sections of the proposed station are shown on plate 20.

The pump station will be furnished with two pumps which will provide the capability to dewater the MSMU during drawdown times and to pump water from the Mississippi River into the MSMU. The sizes of these pumps will be 5,000 gpm and 3,500 gpm, respectively. The pump station will be manually energized when required and will operate automatically until de-energized. Overhead electrical power will be furnished adjacent to the proposed access road.

This station is being furnished with a trash rack on both the MSMU side and the river side due to flow reversals as described. The inverts of the station have been set consistent with refuge ditching and adjacent natural ground elevations. A sedimentation zone has been provided on the MSMU side with an overflow weir protecting the entrance to the station to minimize sediment entering the pump station during drawdown periods.

The station also will contain a 3-foot by 3-foot sluice gate to allow passage of gravity flows. The gate will be operated by an electrically driven motor.

Both pumps and the gate will be located within a cast-in-place concrete building structure. A vandal-resistant and durable structure will be provided.

g. Water Control Structure. A water control structure is proposed as shown in plan view on plate 21. The water control structure will consist of a 36-inch-diameter concrete conduit located within the proposed levee section. The conduit will be controlled by a 3-foot by 3-foot sluice gate which will be fitted with portable power source wrench fittings.

h. Access Road. Access to the pump station and levee system must be constructed as part of the project. Three general alternatives were considered in providing access, which are presented in table 7-1.

TABLE 7-1

Evaluation of Access Road Alternatives

Alternative Description	Pros	Cons	Estimated Initial Construction Cost	Remarks
Access on top of new levee from existing county highway (see plate 3).	Access from county highway provides year-round access reliability; provides good surveillance of refuge activities; provides good maintenance inspection of perimeter levee.	Need right-of-way from county highway for entrance; unauthorized public use could disturb refuge objectives; requires 7,600 feet crushed stone surface on top of the levee to build and maintain; requires 3,600 feet in length of clearing for electric service line.	$52,000	Not feasible due to disturbance of refuge activities, and inaccessibility to pump station across overflow section once overflow commences.
Access across private lands (see plate 3).	Access is remote from public view.	Requires approximately 3,700 feet of access road in addition to an overhead electric service road for electrical supply purposes; existing road to beginning of new access road not maintained by county.	$48,000	Not feasible due to no county maintenance of connecting road to road prior to new access road.

TABLE 7-1 (Cont'd)

Alternative Description	Pros	Cons	Estimated Initial Construction Cost	Remarks
Access from downstream existing cottages.	Located entirely on Government lands and shortest distance, about 3,600 feet of electric supply would follow same route.	Access road would require filling and bank stabilization in vicinity of station 6+30F, as shown on plate 14; access must be coordinated with existing cottage leases and boat docks.	$65,000	Recommended access route.

The recommended access road consists of the construction of approximately 3,600 lineal feet of a 12-foot-wide service road, with typical sections shown on plate 19. The service road access also will be used by the local utility company for placement of overhead poles for electric power supply. IDOC personnel will control egress to the access road to prevent and minimize public access to the refuge area and consequent disturbance.

8. DESIGN AND CONSTRUCTION CONSIDERATIONS.

a. Existing Site Elevations. Construction of the levee and excavation equipment types is dependent upon existing water elevations during the construction period. During normal dry seasons of the year (June through December), conventional excavation equipment can be used for the majority of the levee, diversion drainage ditch excavation, Dead Slough excavation, and associated access road and drainage facilities.

b. Foundations of Structures. Prior to completion of the final plans and specifications, two deep borings will be required to confirm the presence of dense sand below the proposed pump station.

In the areas of the pump station and the water control structure, the levee shall be built 2 feet higher than final grade and consolidated for at least 3 months before excavation of the structure commences.

c. Borrow Sites/Construction Materials.

(1) Borrow Sites. Levee embankment sections with corresponding borrow sites are presented in table 8-1.

TABLE 8-1

Borrow Sources

Levee Embankment Station	Borrow Source	Remarks
Station 12+21C to 11+00	From diversion drainage ditch excavation.	Use Dead Slough excavation as additional borrow if quantity from diversion ditch is insufficient.
Station 11+00 to 8+00CE	From adjacent Dead Slough excavation.	Place uncompacted levee section. Construction activities for the embankment must allow passage of other construction equipment on a 10-foot-wide temporary access road without clear cutting mature timber. Based on further evaluation of soils data, consideration during final design consideration should be given to steepening side slopes and raising the levee profile higher than required (for disposal of excess Dead Slough material). These actions would reduce the levee base width and impacts on the area.
Station 9+00CE to 24+17CE	Adjacent borrow creating permanent pool during drawdown using land-based equipment.	Place uncompacted levee fill.
Station 24+17CE to 30+17CE	Adjacent submergent borrow creating permanent pool during drawdown using floating plant equipment.	Possible alternative embankment material based on most economic section.
Station 30+17CE to 34+50CE	Adjacent to proposed access road.	Additional borrow is available in vicinity of station 23E.

(2) Construction Materials. Only common construction materials are required for this project. Construction of the access road will allow access to the proposed pump station and water control structure.

Riprap and bedding sources are available from nearby river terminals and probably would be transported by floating barge to the project site.

After construction of the access road, construction materials, including concrete, can be transported on the access road to the pump station and the water control structure using conventional equipment.

Because of the significant quantity of bedding and riprap, riprap sources were investigated and are readily available within several miles of the project site. These materials could be transported to the project site by floating barge.

d. Excavation Depths and Equipment. The basis for the proposed Dead Slough access channel and slough excavation is shown in table 8-2.

TABLE 8-2

Basis of Dead Slough Excavation

Elevation	Description
545.0	Flat Pool
-1.0	Low Flow Regulation
-6.0	Maintain Water Depth
-2.0	$25^{\pm}$ Years Sediment Storage a/
536.0	Selected Excavation Bottom

a/ An average rate of 1.0 inch per year was used as the average sedimentation rate for areas normally covered by water (below flat pool).

All excavation for the selected plan was presented and costs were estimated based on common excavation equipment such as draglines, backhoes, or clamshell (as opposed to hydraulic dredging). This equipment must be placed on floating plant for excavating the Dead Slough access channel, portions of the Dead Slough channel excavation, and adjacent to the riprapped weir overflow section. Adjacent disposal reaches have been based on use of typical equipment of this type with normal throw/placement distances.

e. Erosion Control. Riprap is proposed on both sides of the weir overflow section of the perimeter levee to protect against both Mississippi River current during overflow and also against wave erosion during high flow events. The governing riprap design is based on wind-generated wave erosion at this location.

Riprap is also proposed in the area of the pump station for protection of pump embankment slopes and at the entrance of the new Dead Slough Access channel.

An estimated width of approximately 200 feet of existing mature timber will remain in most reaches between the new levee and the Mississippi River to provide a natural buffer from Mississippi River high flood events. This natural undisturbed zone should adequately protect the new levee in Dead Slough.

Seeding will be required immediately following the diversion drainage ditch excavation and also on the proposed levee sections to ensure face stability from erosion forces.

f. Permits. The requirements of Section 404 of the Clean Water Act have been completed as presented in Appendix B, including Section 401 Water Quality Certification. An additional Construction-in-the-Flood Plain permit from the Illinois Division of Water Resources also has been received (see Appendix A).

9. ENVIRONMENTAL EFFECTS.

a. Summary of Effects. The effects of the Selected Plan are summarized in table 9-1.

b. Economic and Social Impacts.

(1) Community and Regional Growth. No significant impacts to the growth of the community or region will result from the project.

(2) Community Cohesion. No adverse impacts to community cohesion will be noticed, due to the nature of the project and its limited area of influence. Since the site is managed as a fish and wildlife refuge by the IDOC and is located in a rural surrounding with limited recreational opportunities, it will result in only a slight increase in recreation visitation to the area.

(3) Displacement of People. No residential relocations will be necessitated by the project.

(4) Property Values and Tax Revenues. The potential value of property at the project site could increase slightly following completion of the project. Since the affected property is in Federal ownership, an increase in its value will not increase local tax revenues.

(5) Public Facilities and Services. The project site is federally owned and zoned for low density recreation. The project will positively impact public facilities by enhancing fish and wildlife habitat and by improving conditions for recreational boating. If no action is taken, recreational opportunities at the Refuge will be reduced and a once important fishery, migratory waterfowl, and furbearer area will be transformed into lowland brush habitat.

(6) Life, Health, and Safety. Currently, the Andalusia Wildlife Refuge poses no threats to life, health, or safety of recreationists or others in the area. The project will not affect current conditions regarding these areas of concern.

TABLE 9-1

Effects of the Preferred Plan on Natural and Cultural Resources

Resource	Effect
Air Quality	No effect
Endangered/Threatened Species	No effect
Habitat Type	
Bottomland Hardwoods	Potential negative impacts on 50-60 acres of bottomland within leveed Refuge due to inundation from water level management; 7.4 acres lost due to levee construction (5.3 acres of which is forested wetland), 3.7 acres lost due to drainage channel relocation; .78 acre at the mouth of Dead Slough; 2 acres from new access road.
Emergent/Submergent Wetlands	2.5 acres filled due to levee construction; 7.2 acres in Dead Slough converted to deep water aquatic from dredging; 9 acres within Refuge converted to nesting islands. 10 acres within Refuge MSMU converted to deep aquatic from channel dredging.
Fisheries	Dredging of Dead Slough will replace 7.2 acres of submergent/emergent with 7.2 acres of new deepwater/backwater habitat and reconnect the now isolated slough with the main river.
Waterfowl	Greatly improved habitat for migratory waterfowl on 130 acres of wetland through improved water level control.
Floodplain	No measurable increase in flood heights.
Historic & Cultural Properties	No effect

TABLE 9-1 (Cont'd)

Prime & Unique Farmlands	No effect
Water Quality	Temporary increase in turbidity during construction of levee and channel dredging. Significantly improved water quality in Dead Slough after construction (i.e., improved D.O. and water circulation).

(7) Employment and Labor Force. Project construction would slightly impact short-term employment in the project area. Rock Island County has a labor pool of large enough size to absorb project needs without noticeable impact. No impacts to long-term employment will result from the project.

(8) Business and Industrial Development. Changes in business and industrial activity during the after-project construction will not be noticed. The project will require no business relocations.

(9) Farm Displacement. No farms will be affected by the environmental enhancement project, as the project site is located entirely on federally owned land.

(10) Noise Levels. No significant long-term noise impacts will result from the project. Heavy machinery will generate an increase in noise during construction. This increase would disturb recreationists in the immediate project vicinity. However, the project site is located in an area with limited residential or other types of development.

c. Natural Resource Impacts.

(1) Man-Made Resources. The proposed new levee will be a man-made resource that will be managed and maintained to provide improved resting and feeding habitat for migratory waterfowl. There are no existing man-made resources in the immediate project area, other than the 9-foot navigation channel project which will be unaffected.

(2) Natural Resources.

(a) Bottomland Forest. The most significant impact from project construction will be the clearing of bottomland forest for the levee right-of-way. Approximately 7.4 acres of hardwoods along the levee alignment must be cleared which consists of mixed-age oak, hickory, silver maple, hackberry, cottonwood, and elm. The timber through which the levee passes is the only stand in the project area containing mast trees (i.e., oak and hickory). In order to minimize the loss of these trees, the levee will be placed as close to the shoreline of Dead Slough as possible. This shoreline alignment is also necessary to allow mechanical excavation of borrow material from Dead Slough. Approximately 4.5 acres along the relocated drainage ditch and the new Dead Slough entrance also will be cleared. Overall, these trees consist of less mature silver maple and cottonwood. Another 2 acres of mostly bottomland

hardwoods will be cleared for the access road and power transmission line. An additional 50 to 60 acres of silver maple/cottonwood within the levee interior may be affected by artificial water level management within the Refuge. These tree species, however, are adapted to long periods of inundation during spring and fall. The severity of impact will depend primarily on the length of time that trees are artificially inundated during the summer growing season and the depth of water.

(b) Fisheries Resources. The proposed project will reduce the almost annual fish kills that now occur in Dead Slough. The new deepwater habitat will allow ingress and egress from Dead Slough to both the Mississippi River main channel and the Refuge interior for spawning and nursery habitat. The creation of the deepwater channels adjacent to shallow vegetated areas will create ideal conditions for both forage and sport fishes. This is important for spawning, cover, and allowing egress when refuge water levels are drawn down in early summer. The creation of deepwater aquatic habitat in a backwater area will provide a critically needed wintering habitat for several fish species (Bodensteiner and Sheehan, 1988). [1] The net project result will be increased fish populations both inside and outside the project.

(c) Waterfowl Resources. The proposed project will create a reliable food supply for fall migratory waterfowl. The new levee and pump station will allow waterfowl biologists to manipulate water levels on 130 acres of wetland to enhance waterfowl food production. The levee also will prevent 2-year flood events from destroying the food crop, significantly improving the Refuge's capacity to provide food and refuge.

The configuration of the channel dredging within the leveed area will create several low elevation islands that will promote nesting of Canada geese. However, the anticipated number of geese using these islands is probably less than a dozen nesting pairs.

(d) Other Wildlife. The increased deep and shallow water habitat will make the area more attractive to semi-aquatic mammals (i.e., muskrat, beaver, and possibly river otter), amphibians and reptiles (i.e., turtles, water snakes), and shorebirds. The loss of mast-producing trees along the levee alignment will decrease available food for some species (i.e., squirrel, deer, wood duck).

(3) Water Quality. The water quality of Dead Slough will improve as a result of the project. The increased depth and reconnection of the slough with the main river channel will improve water circulation, dissolved oxygen, and decrease the rapid fluctuation of water temperature that now occurs. The dredging of Dead Slough will increase turbidity levels during construction. This will have negligible adverse effects since the existing water quality is poor. The relocated drainage channel will improve water quality in

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[1] Bodensteiner, Leo and Robert Sheehan, 1988. Implications of Backwater Habitat Management Strategies to Fish Populations. 43rd Annual Upper Mississippi River Conservation Committee Meeting, Peoria, Illinois, March 8-10, 1988.

Dead Slough and the leveed area. The decrease in sediment input from this stream will improve water quality and prolong the project's life. A more detailed discussion of water quality and prolonged impacts can be found in Appendix B.

(4) Air Quality. No effect.

(5) Endangered Species. The only observed endangered species known to occur in the immediate project vicinity is the bald eagle. During late fall and early winter, migratory eagles are frequently sighted along the entire river in the Rock Island District. As ice cover forms on the river in December, the eagles concentrate in critical wintering locations near the open tailwaters of the locks and dams.

Project construction may discourage use of the area by eagles during fall, but will have no effect on wintering eagles which utilize other wintertime habitats. Based on this evaluation, the project will have no effect on bald eagles or any other State or federally endangered species.

(6) Wetlands. Under Corps wetland determination guidelines, any area below 547.0 feet MSL is wetland regulated by the Corps. Using this criterion, approximately 18 acres of palustrine forested, scrub-shrub, emergent, and aquatic bed wetland classes are common in Pool 16. Aquatic bed wetlands will be filled or cleared as a result of the project. Although these wetlands are valuable from several perspectives, these palustrine wetland classes are common in Pool 16. This loss will have no significant impact on local wetland functions. Operation of the new levee will impose a more regular hydrologic regime upon the wetlands within the levee. Regular and consistent water level control may lead to a decrease in the diversity of wetland types that now exist within the levee. The extent to which this decreased diversity may occur will depend upon water level management and the variability of the substrate elevation (for example, the more uniform the water depth, the more likely that one wetland class will tend to dominate). The proposed project complies with E.O. 11990, Protection of Wetlands. The project was designed to enhance wetland values through application of moist soil management techniques and sedimentation reduction.

(7) Cultural Resources. An archeological survey and geomorphological evaluation of the proposed project area was conducted under the direction of archeologist David Stanley and geomorphologist Jeffery Anderson of Bear Creek Archeology and Donohue and Associates, respectively, from July 23, 1988, to August 1, 1988. A detailed archeological and geomorphological evaluation of the proposed levee alignment, diversion drainage ditch, dead slough access channel, and access road failed to locate any significant historic properties. Isolated chert flakes were present in an area where the proposed access road crosses an alluvial fan. However, these were thought to be relocated from a higher elevation outside the project area. No intact cultural deposits or features were encountered. Based on these field results, it is the conclusion that the proposed Andalusia EMP project will not impact any significant historic properties. By letter dated September 7, 1988, the Illinois State Historic Preservation Officer concurred with this finding.

(8) Relationship of the Proposed Project to Land-Use Plans. The present land use of the entire project area is the management of fish and wildlife resources. This project is compatible with this land use and is designated to enhance and promote these land-use plans. The USFWS also has determined that the proposed project is compatible with existing refuge goals and objectives. (See Appendix A.)

d. Adverse Effects Which Cannot Be Avoided. The clearing of approximately 13 acres of bottomland hardwoods during construction is unavoidable. The possible indirect loss of 50 to 60 acres of additional trees within the leveed area from periodic flooding may be unavoidable if the project is managed as intended.

e. Short-Term Use Versus Long-Term Productivity. The proposed project will improve both the short- and long-term productivity in terms of fishery and waterfowl habitat. The newly leveed area will provide a reliable long-term feeding and resting refuge for waterfowl. Productive deepwater fish habitat will be constructed at the expense of locally abundant emergent wetland occasionally used as fish spawning habitat by some species.

f. Irreversible or Irretrievable Resource Commitments. Aside from the commitment of funds, labor, and construction materials, there will be no permanent loss of natural resources except for the loss of forest and wetland replaced by the project.

g. Compliance with Environmental Quality Statutes. The proposed project complies with all applicable laws and regulations listed in table 9-2.

10. SUMMARY OF PROJECT ACCOMPLISHMENTS.

The proposed project will benefit three major areas: improve water quality by reducing sedimentation in the project area; increase the quantity and quality of reliable waterfowl habitat; and increase fishery habitat.

Construction of the diversion ditch will reduce the present sediment load into the area by approximately 15 percent. This reduction will increase the water quality in the Dead Slough area by reducing suspended solids and agricultural runoff chemicals.

Construction of the moist soil unit with accompanying water level control will provide a reliable resting and feeding area for migrating waterfowl. The MSMU will not only provide a readily available food source in existing open areas, but also an additional food source within the inundated "green tree" portion of the unit. Without implementation of the proposed project, migrating waterfowl will not have reliable resting and feeding areas along this reach of the river for approximately 70 miles. The present usage of approximately 2,000 waterfowl use days should significantly increase due to the project.

TABLE 9-2

Compliance of the Selected Plan with WRC-Designated Environmental Statutes

Federal Policies	Compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Full compliance
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full compliance
Clean Water Act (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.	Full compliance
Coastal Zone Management Act, 16 U.S.C. 1451, et seq.	Not applicable
Endangered Species Act, 16 U.S.C. 1531, et seq.	Full compliance
Estuary Protection Act, 16 U.S.C. 1221, et seq.	Not applicable
Federal Water Project Recreation Act, 16 U.S.C. 460-1(12), et seq.	Full compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 1401, et seq.	Full compliance
Marine Protection Research and Sanctuary Act, 33 U.S.C. 1401, et seq.	Not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Full compliance
National Historic Preservation Act, 16 U.S.C. 470a et seq.	Full compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	Full compliance
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Full compliance
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Not applicable
National Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	Full compliance

The proposed levee construction will prevent most fall floods from entering the MSMU. With the provision of the pump station and the levee system, waterfowl biologists will have the capability to manipulate water levels for optimum waterfowl support on approximately 130 acres of prime Refuge lands.

Aquatic habitat will be improved by providing year-round access to Dead Slough. Dead Slough experienced increasing numbers of fish kills due to low dissolved oxygen. The proposed project should eliminate these conditions by connection to the main river and by providing deeper channel areas. Construction of the deepwater channels adjacent to the shallow vegetated areas of Dead Slough will provide ideal conditions for both forage and sport fishes. Construction of deeper channels in the backwater area of the river will provide critically needed wintering habitat for several fish species.

11. OPERATION, MAINTENANCE, AND REHABILITATION CONSIDERATIONS.

a. Project Data Summary. Table 11-1 presents a summary of project data.

b. Operation. The estimated costs for operation and maintenance of the selected plan are presented in table 13-2.

The gate of the pump station and the water control structure should be operated in an open position, except during periods of MSMU management by IDOC personnel. During desired drawdown periods, the gate of the water control structure and the pump station should be closed and the pump station activated for drawdown purposes. The pump station must be manually activated but will automatically turn off at a low water level of 542.0 MSL. During drawdown periods, the pump station will automatically turn on at elevation 542.5 MSL to maintain the 542.0 drawdown elevation.

After drawdown has occurred and once vegetation has been established in the MSMU, either adjacent tributary inflow, seepage, or opening of the water control structure gate or the pump station gate will allow water into the MSMU area. Use of gates should be controlled to achieve desired water levels consistent with vegetative growth.

When it is desired to pump from the river into the MSMU, the station must be manually activated and will continue pumping automatically until elevation 547.0 MSL (which can be adjustable to elevation 550.8, the elevation of the levee overflow). It is anticipated that ponding levels higher than elevation 547.0 will cause damage to adjacent agricultural fields during crop growing seasons. Coordination between the IDOC and adjacent property owners during the non-crop season must be effected by the IDOC to realize higher MSMU elevations than 547.0. IDOC must determine the trade-offs of operating higher than 547.0 for additional MSMU acres versus potential negative impacts and associated coordination. The highest MSMU elevation of 550.8 MSL will occur when water reaches the elevation of the overflow weir.

During periods of drawdown and when river events reach elevation 550.0 MSL with predicted stage to increase, the gates of the water control structure and the station should be opened in efforts to fill the interior of the levee

without overtopping. Should the river stage exceed 550.8 MSL prior to filling using the existing water control structure and pump station conduits, the remainder of overflow will occur by means of a riprapped overflow weir station.

The Rock Island District will prepare an operation and maintenance manual for the IDOC during the design phase.

TABLE 11-1

Andalusia Refuge Project Data Summary of Proposed Features

Perimeter Levee		
Embankment fill	122,000	Cubic Yards
Length	8,600	Feet
Crown elevation	552.8	Station 12+21C to Station 11+00
	552.8 to 551.8	Varies from Station 11+00 to Station 24+17CE
	550.8	From Station 25+17CE to Station 29+17CE
	551.8	From Station 30+17CE to Station 34+50CE
Side slopes	4:1	Horizontal to vertical from Station 12+21C to 8+00CE. Slopes flattened for overflow and soft material placement purposes
	4:1	From Station 9+00CE to Station 34+50CE
Armored overflow levee section		
Length	600	Feet
Overflow elevation	550.8	MSL
Riprap	3,370	Tons
Diversion Drainage Ditch		
Approximate length	2,430	Feet
Average width	30	Feet
Average depth	3	Feet

TABLE 11-1 (Cont'd)

Bottom slope	.0025	Foot per foot
Watershed area	1,152	Acres
Capacity of channel	340	CFS (2-year precipitation event)
Dead Slough Channel Excavation		
Adjacent to Levee		
Approximate length	4,500	Feet
Width at bottom	60	Feet
Bottom elevation	536.0	MSL
Volume of excavation	87,000	CY
River Access Excavation		
Approximate length	1,100	Feet
Width at bottom	30	Feet
Bottom elevation	536	MSL
Volume of excavation	23,000	CY
Refuge Drainage/Island Construction		
Interior drainage with islands		
Length	8,600	Feet
Width	40	Feet
Bottom elevation	542.0±	MSL
No. of islands	8	Each
Area of an island above elevation 545.0	9.0	Acres
Interior drainage for adjacent levee borrow		
Length	2,300	Feet
Width at bottom	20	Feet
Bottom elevation	536.0	MSL
Pump Station		
Submersible pumps		
Emptying pump	1	Each: 5,000 gpm at 14.3 TDH
Filling pump	1	Each: 3,500 gpm at 7.8 TDH
Sluice gate	1	Each: 3 feet x 3 feet

TABLE 11-1 (Cont'd)

Operating elevations		
Refuge max. elevation	550.8	MSL (overflow elevation)
Refuge min. elevation	542.0	MSL
Sump floor elevation	539.5	MSL
Equipment floor elevation	560.0	MSL (100-year Mississippi River event)
Electric power source		
Primary supply	7,620	Volts, 1 phase
Secondary station supply	480/277	Volts, 1 phase
Transformer size	37.5	KVA, 1 phase
Power converter	37.5	KVA, 3 phase
Trash racks upper and lower ends	2	Each
Water Control Structure		
Sluice gate	1	Each: 3 feet x 3 feet
Invert	542.0	MSL
Access Road		
Approximate length	3,600	Feet
Width	12	Feet, with crushed stone surface

c. Maintenance and Rehabilitation. The proposed features have been designed to ensure low annual maintenance requirements with the estimated annual maintenance and rehabilitation costs presented in table 13-2. These quantities and costs may change during final design. The principal maintenance features consist of levee inspection, mowing, diversion ditch cleanout, levee repair as needed, riprap replacement, and pump station maintenance.

12. PROJECT PERFORMANCE ASSESSMENT.

The purpose of this section is to summarize monitoring aspects of the project. The principal types, purposes, and responsibility of project monitoring are presented in table 12-1. The plan for post-construction qualitative field observations and quantitative measurements are presented in tables 12-2 and 12-3, respetively.

TABLE 12-1

Monitoring Plan

Type Monitoring	Purpose	Responsibility	Comments
Pre-Project	Establish need of proposed project/ features	Sponsor (coordinated w/Corps of Engineers)	See Sections 2 and 3
Design	Establish baseline conditions consistent with project goals and objectives and meet specific permit/environmental requirements	Corps of Engineers	See Plates 23-25 and Appendix B
Construction	Assess construction impacts and meet permit requirements	Corps of Engineers	To be included in construction contract documents
Post-Construction	Assess performance of project relative to goals and objectives	1. Sponsor (qualitative) 2. Corps of Engineers (quantitative)	1. Table 12-2 2. Table 12-3

TABLE 12-2

Annual Post-Construction Qualitative Field Observations 1/

Goals	Objectives	Field Observations
Enhance Migratory Waterfowl Habitat	Increase reliable food production area (moist soil species).	As observed
	Increase reliable resting and feeding water area.	As observed
Enhance Aquatic Habitat	Restore deep (6 feet) aquatic habitat volume.	As observed
	Restore lentic-lotic habitat access cross-sectional area.	As observed
	Improve dissolved oxygen concentration during critical seasonal stress periods.	As observed
Reduce Sedimentation in Refuge	Decrease adjacent tributary sediment volume.	As observed

1/ Submit to Corps of Engineers with annual management report for Cooperative Agreement lands.

TABLE 12-3

Post-Construction Quantitative Measurements

Goals	Objectives	Unit of Measure	Monitoring Plan	Monitoring Interval (Years)
Enhance Migratory Waterfowl Habitat	Increase reliable food production area (moist soil species).	Acres	Perform specie vegetation surveys.	1
	Increase reliable resting and feeding water area.	Acres	Determine surface acres inundated	1
Enhance Aquatic Habitat	Restore deep (6 feet) aquatic habitat volume.	Acre-Feet	Perform hydro-graphic soundings of excavated Dead Slough.	5
	Restore lentic-lotic habitat access cross-sectional area.	Square Feet	Perform hydro-graphic soundings of excavated section.	5
	Improve dissolved oxygen concentration during critical seasonal stress periods.	mg/l	Perform dissolved oxygen tests.	.25
Reduce Sedi-mentation in Refuge	Decrease adjacent tributary sediment volume.	Acre-Feet/ Year	Perform survey of selected ranges.	5

13. COST ESTIMATES.

A detailed estimate of initial construction costs is presented in table 13-1. A detailed estimate of operation, maintenance, and rehabilitation costs is presented in table 13-2. Quantities may vary during final design and construction.

TABLE 13-1

Andalusia Refuge Initial Construction Detailed Estimate of Cost
(July 1988 Price Levels)

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Perimeter Levee				
Clearing/grubbing	10	AC	3,175.00	31,750
Embankment fill	122,000	CY	2.50	305,000
Bedding	1,120	TN	22.00	24,640
Riprap	3,370	TN	24.0	80,880
Seeding	10	AC	1,650.00	16,500
				458,770
Existing Ditch Relocation				
Clearing/grubbing	4	AC	3,175.00	12,700
Excavation	11,700	CY	3.00	35,100
Seeding	4	AC	1,650.00	6,600
				54,400
Dead Slough Improvement				
Clearing/grubbing	1	AC	3,175.00	3,175
Excavation for adjacent levee	87,000	CY	3.00	261,000
Excavation for river access	23,000	CY	5.00	115,000
Seeding	0.5	AC	1,650.00	825
				380,000
Refuge Improvement				
Excavation with side cast Placement for islands	48,000	CY	3.00	144,000
Excavation for adjacent levee	27,000	CY	3.00	81,000
				225,000

TABLE 13-1 (Cont'd)

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Pump Station				
Civil/site work	1	JOB	SUM	195,000
Pumps, motor, control, gates	1	JOB	SUM	45,000
Overhead power supply	1	JOB	SUM	15,000
				255,000
Water Control Structure Between Dead Slough and Refuge	1	JOB	SUM	45,000
Access Road				
Clearing/grubbing	2	AC	3,175.00	6,350
Excavation	3,000	CY	3.00	9,000
Embankment fill	4,100	CY	3.00	12,300
Crushed stone surface	1,240	TN	14.00	17,360
Riprap	825	TN	24.00	19,800
				64,810
Subtotal				1,482,980
Contingencies				274,020
				1,757,000
Engineering and Design				217,000
Supervision and Administration				121,000 1/
TOTAL PROJECT				$2,095,000 1/

1/ Includes General Design costs of $226,000.

TABLE 13-2

Andalusia Refuge Estimate of Annual Operation, Maintenance, and Rehabilitation Costs
(July 1988 Price Levels)

Item	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Operation 1/				
Pump station energy	12,000	kWh	.10	1,200
Gate operation	20	Hr	17.00	340
Subtotal-Operation				1,540
Maintenance				
Levee inspection	40	Hr	17.00	680
Levee mowing (4 mowings per year)	32	AC	30.00	960
Diversion ditch cleanout	267	CY	3.00	801
Levee erosion	130	CY	15.00	1,950
Riprap replacement	33	TN	24.00	792
Access road crushed stone	10	TN	20.00	200
Pump station maintenance (debris and sediment removal, mechanical/electrical)	80	Hr	30.00	2,400
Subtotal-Maintenance				7,783
Rehabilitation				2/
Subtotal				9,323
Contingencies				2,077
Total per year				$11,400

1/ Natural seeding for plant establishment in MSMU assumed.

2/ Rehabilitation cannot be accurately estimated. Rehabilitation is reconstructive work that significantly exceeds the annual operation and maintenance requirements identified above and which is needed as the result of major storm or flood events.

14. REAL ESTATE REQUIREMENTS.

a. General. All project features are located on Corps of Engineers-owned General Plan lands. These lands are managed under a Cooperative Agreement between the Department of Interior, USFWS, and the Corps of Engineers dated February 14, 1963. Management of these project lands is administered by the IDOC under a third party Cooperative Agreement between the USFWS and IDOC.

b. Local Cooperation Agreement/Cost-Sharing. Funds for the initial construction of the proposed project are proposed for 100 percent Federal funding. The Andalusia Refuge project is part of the Mark Twain National Wildlife and Fish Refuge system. The Water Resources Development Act of 1986 (Public Law 99-662) is the basis for the first cost Federal funding and provides:

> Section 906. FISH AND WILDLIFE MITIGATION
>
> (e) ... the first cost of such enhancement shall be a Federal cost when - such activities are located on lands managed as a national wildlife refuge.

A draft agreement between the Corps of Engineers and the USFWS has been included in this report as appendix C. Estimated operation and maintenance costs are presented in table 13-2.

15. SCHEDULE FOR DESIGN AND CONSTRUCTION.

Table 15-1 presents a schedule of project completion steps.

16. IMPLEMENTATION RESPONSIBILITIES AND VIEWS.

a. Corps of Engineers. The Corps of Engineers, Rock Island District, is responsible for project management and coordination with the USFWS, the IDOC, and other affected agencies. The Rock Island District will prepare and submit the subject DPR; program funds; finalize plans and specifications; complete all National Environmental Policy Act requirements; advertise and award a construction contract; perform construction contract supervision and administration; and perform post-construction project evaluations.

TABLE 15-1

Project Implementation Schedule

Requirements	Scheduled Date
Submission of Draft Definite Project Report (DPR) to Corps of Engineers, North Central Division and participating agencies for review	Sep 88
Obtain North Central Division approval of draft DPR	Oct 88
Formal Distribution of DPR for public and agency review	Nov 88
Submit final and public reviewed DPR to North Central Division	Jan 89
North Central Division submission of final report to Chief of Engineers	Feb 89
Receive plans and specifications funds	Mar 89
Obtain construction approval by Assistant Secretary of the Army (Civil Works)	Mar 89
Execution of operation and maintenance agreement by USFWS and Rock Island District	Apr 89
Submit final plans and specifications to North Central Division for review and approval and to participating agencies for review	May 89
Obtain approval of the plans and specifications	Jun 89
Advertise contract	Jul 89
Complete construction	Dec 90

b. U.S. Fish and Wildlife Service. The USFWS should ensure that all proposed features are compatible with Refuge objectives and management strategies and ensure that operation and maintenance described in table 13-2 of this report is performed in accordance with Section 906(e) of the Water Resources Development Act of 1986.

c. Illinois Department of Conservation. The IDOC is responsible for the non-Federal share of operation and maintenance as estimated in table 13-2 of this report and the non-Federal share of any mutually agreed upon rehabilitation of this project on cooperative agreement lands

17. COORDINATION, PUBLIC VIEWS, AND COMMENTS.

a. Coordination Meetings. Close coordination between Corps of Engineers, USFWS, and IDOC personnel was effected during the planning period. A listing of meetings follows:

(1) November 29, 1986 - Onsite meeting to discuss project objectives and scope.

(2) March 4, 1987 - Meeting at Rock Island District, Corps of Engineers, to further scope project and define objectives.

(3) February 4, 1988 - Meeting at Rock Island District, Corps of Engineers, to discuss/coordinate preliminary DPR.

(4) June 29, 1988 - Meeting at Rock Island District, Corps of Engineers, an onsite review of proposed project features and proposed timber clearing practices.

b. Environmental Review Process. This project meets the requirements of the National Environmental Policy Act, as evidenced by the Environmental Assessment, which is an integral part of this report, and preliminary Finding of No Significant Impact.

18. CONCLUSIONS.

Andalusia Refuge has been recommended to the Corps of Engineers, Rock Island District, by various inter-agency coordination committees for priority inclusion into the Environmental Management Program. With proposed project features in place, the Refuge will enhance migratory waterfowl habitat by providing an increased food source within a reliable water-control unit and will improve fisheries. The Refuge is ideally sited in Pool 16 as a resting area for Mississippi River flyway waterfowl.

Sedimentation from both adjacent watersheds and the river has been the principal cause of the general waterfowl and fishery habitat degradation. Sedimentation has converted a former backwater fishery in Dead Slough into a shallow, land-locked area with no present fishery.

Alternative B (130-acre MSMU protected by 2-year levee), Alternative E (adjacent watershed flow and sediment diversion), Alternative G (Dead Slough aquatic improvement), and Alternative H (Refuge drainage/island construction) all meet project objectives and are compatible with Refuge management objectives.

19. RECOMMENDATIONS.

I have weighed the accomplishments to be obtained from this environmental enhancement project against its cost and have considered the alternatives, size, and scope of the proposed project. In my judgement, the proposed project is a justified expenditure of Federal funds. I recommend that the

Secretary of the Army approve construction of a 130-acre Moist Soil Management Unit, protected by a 2-year levee, adjacent watershed flow and sediment diversion, Dead Slough aquatic improvement, and Refuge drainage/island construction for habitat rehabilitation and enhancement of Andalusia Refuge in Rock Island County, Illinois. The total estimated Federal construction cost of the habitat project is $1,869,000, which amount would be a 100 percent Federal cost according to Section 906(e)(3) of Public Law 99-662. I further recommend that funds in the amount of $24,000 be allocated as quickly as possible for the preparation of plans and specifications.

20. FINDING OF NO SIGNIFICANT IMPACT.

Having reviewed the information contained in this environmental assessment, I find that construction of the Andalusia Refuge Habitat Rehabilitation and Enhancement project will have no significant adverse impacts on the environment. This project is not a major Federal action and, therefore, preparation of an Environmental Impact Statement (EIS) is not required. This determination may be reevaluated if warranted by later developments. Factors that were considered in making this determination were:

a. The project will significantly improve the quality of fish and wildlife habitat.

b. Aside from the loss of bottomland forest and wetland, this project will have negligible adverse impacts on aquatic and terrestrial resources.

c. Public review of this document has resulted in no significant adverse comments.

13 Feb 89
Date

Neil A. Smart
Colonel, U.S. Army
District Engineer

APPENDIX A

CORRESPONDENCE

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT
WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

ANDALUSIA REFUGE
REHABILITATION AND ENHANCEMENT

POOL 16, MISSISSIPPI RIVER MILES 462 THROUGH 463
ROCK ISLAND COUNTY, ILLINOIS

APPENDIX A
CORRESPONDENCE

TABLE OF CONTENTS

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
MARK FRECH, DIRECTOR

January 27, 1989

Colonel Neil A. Smart
District Engineer
U.S. Army Corps of Engineers
Rock Island District
P.O. Box 2004
Rock Island, IL 61204-2004

Dear Colonel Smart:

As stated in the enclosed letter to James C. Gritman, Regional Director, U.S. Fish and Wildlife Service, the Department supports the Environmental Management Program's Andalusia Refuge Project in Pool 16 of the Mississippi River.

Upon completion and final acceptance of the project by the Corps of Engineers and the Fish and Wildlife Service, the Department agrees to cooperate with the Fish and Wildlife Service to operate and maintain the project 100% as described in the Definite Project Report.

Sincerely,

Mark Frech

Mark Frech
Director

MF/BD/sf
cc: James Gritman

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
FEDERAL BUILDING, FORT SNELLING
TWIN CITIES, MINNESOTA 55111

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
FWS/ARW

JAN 26 1989

Colonel Neil A. Smart
District Engineer
U.S. Army Engineering District, Rock Island
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Smart:

The U.S. Fish and Wildlife Service has reviewed the Definite Project Report for the Andalusia Refuge wetland complex rehabilitation project. This project located in Pool 16 of the Upper Mississippi River in Rock Island County, Illinois, is proposed under the Water Resources Development Act of 1986 (Public Law 99-662) as part of the Upper Mississippi River System Environmental Management Program.

The Andalusia project has been coordinated with the Service and we approve and support the project as planned and described in the Definite Project Report. This project is situated on general plan lands owned by the Corps of Engineers and managed by the State of Illinois. The Service retained an interest in the lands for purposes of migratory bird habitat, and has determined the selected alternative is compatible with the purpose for which the lands were included in the National Wildlife Refuge system. Enclosed is our compatibility determination.

Operation and maintenance responsibilities for this project as described in the Definite Project Report will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986.

We look forward to our continued cooperative efforts in developing habitat rehabilitation and enhancement projects under the Environmental Management Program. If we can be of further assistance, please let us know.

Sincerely,

Marvin E. Moriarty
Acting Regional Director

Enclosure

COMPATIBILITY DETERMINATION

Station Name: Mark Twain National Wildlife Refuge Complex

Date Established: 1958

Establishing Authority: Fish and Wildlife Coordination Act, Section 3 (48 Stat. 401)

Description of Proposed Use: Rehabilitation of the wetland complex within the Andalusia Refuge, Pool 16, Upper Mississippi River, Rock Island County, Illinois. This is a habitat rehabilitation and enhancement project sponsored by the Illinois Department of Conservation.

Anticipated Impacts on Refuge Purpose (s): No negative impacts are anticipated, if this project is constructed in accord with the agreements reached on site on June 29, 1988.

Stipulations That Would Make a Use Compatible With Refuge Purpose (s): DNA

Justification: The proposed project will restore and enhance an important wetland complex for migratory waterfowl and provide important spawning and nursery areas for fish.

Determination: The proposed use is compatible with the purposes for which the refuge was established.

Determined by: _____ Date: 9/21/88
Project Leader (Name/Title/Signature)

Reviewed by: _____ Date: 9/27/88
Regional Supervisor (Name/Title/Signature)

Concurred by: _____ Date: 10/3/88
Regional Director

Illinois Environmental Protection Agency · P. O. Box 19276, Springfield, IL 62794-9276

217/782-0610

Corps of Engineers Rock Island District (Rock Island County)
Andalusia Refuge EMP -- Mississippi River
Log C-730-88 [CoE Appl. 174040]

January 17, 1989

Mr. James H. Blanchar, P.E.
Chief, Operations Division
Rock Island District
Corps of Engineers
Clock Tower Building
Rock Island, Illinois 61201

Dear Mr. Blanchar:

This Agency received a request on August 19, 1988, from the Rock Island District Corps of Engineers requesting necessary comments for environmental consideration concerning the construction of an 8,600 foot long levee, a water control structure and a pump station in the Andalusia Refuge. A new channel outlet will be constructed to the Mississippi River to divert flow from Dead Slough. Approximately 158,000 cubic yards of material will be excavated from the slough for aquatic habitat development. We offer the following comments.

Based on the information included in this submittal, it is our engineering judgment that the proposed project may be completed without causing water pollution as defined in the Illinois Environmental Protection Act, provided the project is carefully planned and supervised.

These comments are directed at the effect on water quality of the construction procedures involved in the above described project and is not an approval of any discharge resulting from the completed facility, nor an approval of the design of the facility. These comments do not supplant any permit responsibilities of the applicant towards this Agency.

This Agency hereby issues certification under Section 401 of the Clean Water Act (PL 95-217), subject to the applicant's compliance with the following conditions:

1. The applicant shall not cause:

   a. violation of applicable water quality standards of the Illinois Pollution Control Board, Title 35, Subtitle C: Water Pollution Rules and Regulations;

   b. water pollution as defined and pronibited by the Illinois Environmental Protection Act; and

   c. interference with water use practices near public recreation areas or water supply intakes.

2. The applicant shall provide adequate planning and supervision during the project construction period for implementing construction methods, processes and cleanup procedures necessary to prevent water pollution and control erosion.

3. Any spoil material excavated, dredged or otherwise produced must not be returned to the waterway but must be deposited in a self-contained area in compliance with all State statutes, regulations and permit requirements with no discharge to the waters of the State unless a permit has been issued by this Agency. Any back filling must be done with clean material and placed in a manner to prevent violation of applicable water quality standards.

4. All areas affected by construction shall be mulched and seeded as soon after construction as possible. The applicant shall undertake necessary measures and procedures to reduce erosion during construction. Interim measures to prevent erosion during construction shall be taken and may include the installation of staked straw bales, sedimentation basins and temporary mulching. All construction within the waterway shall be conducted during zero or low flow conditions.

5. The applicant shall implement erosion control measures consistent with the "Standards and Specifications for Soil Erosion and Sediment Control" (IEPA/WPC/87-012).

6. The channel relocation shall be constructed under dry conditions and stabilized to prevent erosion prior to the diversion of flow.

7. The erosion control plans and specifications for levee construction shall be submitted to the Agency for approval prior to construction.

8. This certification becomes effective when the Department of the Army, Corps of Engineers, includes the above conditions #1 through 7 as conditions of the requested permit issued pursuant to Section 404 of PL. 95-217.

This certification does not grant immunity from any enforcement action found necessary by this Agency to meet its responsibilities in prevention, abatement, and control of water pollution.

Very truly yours,

Thomas G. McSwiggin, P.E.
Manager, Permit Section
Division of Water Pollution Control

TGM:BY/mls/0193k/7

cc: IEPA, DWPC, Records Unit
DWPC, Field Operations Section, Region 3
IDOT, Division of Water Resources, Springfield
USEPA, Region V
USFWS, Rock Island
IDOC

Illinois Department of Transportation
Division of Water Resources
2300 South Dirksen Parkway/Springfield, Illinois/62764

December 23, 1988

U. S. Army Corps of Engineers
Clock Tower Building, P. O. Box 2004
Rock Island, Illinois 61204-2004

Attn: CENCR-ED-DG (Holmes)

RE: Permit #19443

Gentlemen:

We are enclosing Permit No. 19443 authorizing the construction of a 2-year levee approximately 8600 feet long, a pump station, a water control structure, excavated channels, a diversion ditch, an access road, and an overhead electric power supply in conjunction with the development of the Andalusia Wildlife Refuge, all in the flood plain of the Mississippi River in Sections 1 and 2, Township 16 North, Range 5 West of the 4th Principal Meridian and Sections 35 and 36, Township 17 North, Range 5 West of the 4th Principal Meridian in Rock Island County.

If any changes in the plans or location of the work are found necessary, revised plans should be submitted promptly to this office so that they may receive approval before work thereon is begun. When the work is done, please provide written notification that the project has been completed in accordance with the approved plans and conditions of the permit.

Please acknowledge receipt of this permit by having the attached acceptance blank properly executed and returned to us within sixty (60) days from the date of the permit.

Sincerely,

David R. Boyce

David R. Boyce, P.E.
Chief Flood Plain Management
Engineer

DRB:RWP:edc
cc: COE-Rock Island District (Regulatory Functions Branch)
Department of Conservation
Environmental Protection Agency

TE OF ILLINOIS

Pern
Nº 1

rtment of Transportation

ision of Water Resources

300 South Dirksen Parkway
Springfield, Illinois 62764

Hereby Granted, this 23rd day of December

To

U. S. ARMY CORPS OF ENGINEERS
CLOCK TOWER BUILDING, P. O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

levee approximately 8600 feet long, pump station, a wate
avated channels, a diversion ditch, an access road, and
r supply in conjunction with the development of the Anda
n the flood plain of the Mississippi River in Sections 1
Range 5 West of the 4th Principal Meridian and Sections
rth, Range 5 West of the 4th Principal Meridian in Rock
s

cation dated September 2, 1988, and the specifications and plans e

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
DEFINITE PROJECT REPORT (R-4)
ITH INTEGRATED ENVIRONMENTAL ASSESSMENT
ANDALUSIA REFUGE
BILITATION AND ENHANCEMENT; NOVEMBER, 1988

Transportation and made a part hereof, and subject to the terms and s

:

e Management.

APPROVED:

Gregory W. Baise Sec

THIS PERMIT is subject to the following conditions:

(a) This permit is granted in accordance with an act entitled: "AN ACT in relation to the regulation of the rivers, lakes and streams of the State of Illinois," approved June 10, 1911, as amended. (Ill. Rev. Stat., ch. 19, par. 52, et. seq.)

(b) This permit does not convey title to the permittee or recognize title of the permittee to any submerged or other lands, and furthermore, does not convey, lease or provide any right or rights of occupancy or use of the public or private property on which the project or any part thereof will be located, or otherwise grant to the permittee any right or interest in or to the property, whether the property is owned or possessed by the State of Illinois or by any private or public party or parties.

(c) This permit does not release the permittee from liability for damage to persons or property resulting from the work covered by this permit, and does not authorize any injury to private property or invasion of private rights.

(d) This permit does not relieve the permittee of the responsibility to obtain other federal, state or local authorizations required for the construction of the permitted activity; and if the permittee is required by law to obtain approval from any federal agency to do the work, this permit is not effective until the federal approval is obtained.

(e) The permittee shall, at his own expense, remove all temporary piling, cofferdams, false work, and material incidental to the construction of the project, from the floodway, river, stream or lake in which the work is done. If the permittee fails to remove such structures or materials, the state may have removal made at the expense of the permittee. If future need for public navigation or public interests of any character, by the state or federal government, necessitates changes in any part of the structure or structures, such changes shall be made by and at the expense of the permittee or his successors as required by the Department of Transportation or other properly constituted agency, within sixty (60) days from receipt of written notice of the necessity from the Department or other agency, unless a longer period of time is specifically authorized.

(f) The execution and details of the work authorized shall be subject to the supervision and approval of the Department. Department personnel shall have right of access to accomplish this purpose.

(g) The permittee shall file with the Department a properly executed acceptance of all terms and conditions of the permit within sixty (60) days of receipt of the permit; however, starting work on the construction authorized will be considered full acceptance by the permittee of the terms and conditions of the permit.

(h) The Department in issuing this permit has relied upon the statements and representations made by the permittee; if any statement or representation made by the permittee is found to be false, the permit may be revoked at the option of the Department; and when a permit is revoked all rights of the permittee under the permit are voided.

(i) If the project authorized by this permit is located in or along Lake Michigan or a meandered lake, the permittee and his successors shall make no claim whatsoever to any interest in any accretions caused by the project.

(j) In issuing this permit, the Department does not approve the adequacy of the design or structural strength or the structure or improvement.

(k) Noncompliance with the conditions of this permit will be considered grounds for revocation.

(l) If the work permitted is not completed on or before December 31, 1991 this permit shall be void.

THIS PERMIT is subject to further special conditions as follows:

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
MARK FRECH, DIRECTOR

December 21, 1988

Colonel Neil A. Smart
District Engineer
Rock Island Corps District
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

Thank you for your November 15, 1988 letter and copies of the Definitive Project Report and Environmental Assessment concerning the Andalusia Refuge EMP Project.

The Department is committed to operation and management of the Andalusia Refuge project and my staff continues to work on finalization of details concerning our O&M responsibilities and the Local Cooperation Agreement.

Thank you for the opportunity to comment. We look forward to completion of this important project.

Sincerely,

Mark Frech

Mark Frech
Director

MF:RWL:gb

cc: USFWS, Rock Island

December 19, 1988

Attention: Dan Holmes
U.S. Army Engineer District Rock Island
Clock Tower Building
P. O. Box 2004
Rock Island, Illinois 61204-2004

Subject: ANDALUSIA REFUGE

Dear Dan,

I feel the rehabilitation of the Andalusia Refuge is great for this area. It should enhance the fishing in Dead Slough and hopefully will draw more waterfowl to the Refuge.

My concern is the land use of the Refuge. I was under the impression that all the Refuge would be closed to all trespassing from October 1 thru December 31 in order to provide a resting area for migratory waterfowl.

Presently, it is not being managed that way. I.D.O.C. is allowing deer hunting (bow and arrow and shotgun) from private property to water's edge. I have seen the ducks chased from the Refuge when shooting occurred during the shotgun season. Also, this narrow strip of the Refuge they are hunting on is a so-called alley-way for hunters to trespass on private property.

The off-road vehicles are a nuisance to the waterfowl also. As you and your staff have probably noticed, they have trails from the County blacktop to the proposed new entrance road, all on Refuge property.

I feel this policy of allowing trespassing form October 1 thru December 31 should stop. The change should be immediately, not waiting for the Rehabilitation and Enhancement Program to be completed.

Thank You
Sincerely,
Ronald Morrison

Ronald Morrison
23711 120 Ave. W
P.O. Box 37
Illinois City, Illinois 61259

cc: Illinois Department of Conservation
Attention: Marc Frech, Director

CONVERSATION RECORD	TIME: 10:30	DATE: 12-14-88
TYPE ( )VISIT ( )CONFERENCE	(x)TELEPHONE ( )INCOMING ( )OUTGOING	ROUTING: NAME/SYMBOL: INT
NAME OF PERSON CONTACTED:	ORGANIZATION: USGS	TELEPHONE: ( ) -
SUBJECT: Andalusia Refuge EA		

SUMMARY: The U.S. Geology Survey Reston in Virgina called to relay that they had no comments on the Andalusia Refuge EA.

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION:	SIGNATURE	DATE
Karen Bahus	Karen L. Bahus	12/14/88

ACTION TAKEN

SIGNATURE	TITLE	DATE

50271-101 CONVERSATION RECORD (12-76)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ROCK ISLAND FIELD OFFICE (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

IN REPLY REFER TO:
COM: 309/793-5800
FTS: 386-5800

December 13, 1988

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

The U.S. Fish and Wildlife Service has reviewed the project plan(s) advertised by the public notice(s) on the following list. Based on the information provided, the U.S. Fish and Wildlife Service has no objection to the issuance of the related permit(s). This letter provides comment under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973, as amended.

Notice No.	Date	Applicant	Due Date
CENCR-174040	11-23-88	U.S. Army Corps of Engineers	12-23-88

Sincerely,

Richard C. Nelson
Field Supervisor

cc: ILDOC
USEPA
ILEPA

To: CNCR (157:ACE2019)
From: DREDGE/FILL (EPA9562) Delivered: Mon 12-Dec-88 16:07 EST Sys 163 (44)
Subject: ATTENTION STEVEN VANDERHORN
Mail Id: IPM-163-881212-145190001

5WQA-TUB-8

December 12, 1988

Steve VanderHorn, Chief
Regulatory Functions Branch
Rock Island District, Corps of Engineers
Department of the Army
Clock Tower Building
Rock Island, Illinois 61201-2004

Dear Mr. VanderHorn:

The U.S. Environmental Protection Agency has received the Public Notice(s) of the proposed project(s) as described on the following list. We are unable to review the project(s) for the impacts on water quality, wetlands, or other water resource concerns. Therefore, no action is contemplated at this time.

In the event that information becomes available or an unexpected adverse impact results from any of these activities, we would appreciate the opportunity to review the project(s).

NOTICE_NO./NOTICE_DATE	APPLICANT	COMMENTS_DUE
CENCR-174020/12-02-88	Mr. Duane Glader	12-22-88
✓CENCR-174040/11-23-88	U.S. Army Corps of Engineers	12-23-88

If you have any questions concerning this matter, please contact Ms. A. Marie Ecton of my staff, at 312/886-5266.

Sincerely yours,

James D. Giattina, Chief
Planning and Standards Section

cc: Richard Nelson, Fish & Wildlife Service, Rock Island, IL
James Park, Illinois Environmental Protection Agency, Springfield, IL
Robert Schanzle, Illinois Department of Conservation Springfield, IL

State of Illinois
DEPARTMENT OF AGRICULTURE
Division of Natural Resources
State Fairgrounds, P.O. Box 19281, Springfield, IL 62794-9281, 217/782-6297

Bureau of Farmland Protection Bureau of Soil Conservation

December 8, 1988

Colonel Neil A. Smart
District Engineer
US Army District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Re: Definite Project Report
with Integrated Environmenal Assessment
Andalusia Refuge
Rehabilitation and Enhancement
Pool 16, Mississippi River Miles 462 through 463
Rock Island County, Illinoi

Dear Colonel Smart:

The Illinois Department of Agriculture has completed its review of the Andalusia Refuge Rehabilitation and Enhancement Project Report for its potential impact to agricultural land. We submit the following comments.

The proposed project consists primarily of the construction of a 2-year event levee and a pump station. The levee will be 8600 feet long, up to 110 feet wide, and will provide water level control on 130 acres of Refuge land. The pump station will be capable of pumping 3500 gallons per minute into the Refuge and 5000 gallons per minute from the Refuge. Fill material for the levee will be excavated from Dead Slough, from the interior of the newly leveed Refuge and from the diversion drainage ditch.

This levee has only been designed for the two year event. Approximately 7.4 acres of woodland and 2.5 acres of submergent/emergent wetland will be lost in a 40 to 100 feet wide path along the Refuge's perimeter levee.

A new access road 3600 feet long and an electrical transmission line will also be constructed. These will follow the government property line from the pump station to a country road which abuts Corps land just outside the project site. Approximately two acres of timber will be cleared for this access.

Because the proposed improvements will be confined within the boundaries of the Andalusia Refuge and productive farmland will not be impacted by the project, the Illinois Department of Agriculture fully supports the Corps' recommendation for implementation.

Sincerely,

Teresa J. Savko

Teresa J Savko
Bureau of Farmland Protection

TJS:mdg

cc: Rock Island County SWCD

United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Intermountain Field Operations Center

December 7, 1988

District Engineer, Rock Island District
U.S. Army Corps of Engineers
Attn: CENCR-PD-R
Clock Tower Building--P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sir:

Subject: Review of Environmental Assessment, and Definite Project Report for the Andalusia Refuge Rehabilitation and Enhancement, Rock Island County, Illinois (ER-88/1004)

Personnel of the Intermountain Field Operations Center, Bureau of Mines, reviewed the subject reports for possible conflict with mineral resources and mineral-producing facilities, as requested by the Director, Office of Environmental Project Review. The reports discuss various alternative plans to enhance waterfowl habitat at the Andalusia Wildlife Refuge.

The Bureau of Mines' primary concern is potential project impacts on mineral resources and their development. Although the reports do not mention mineral resources, the nature of the project is such that we anticipate no significant impact to the mineral resources (sand and gravel and coal) in the area. Therefore, we suggest a statement to that effect be incorporated in subsequent versions of the documents. Such an inclusion would provide users of the documents with knowledge that mineral resources had been considered during project planning.

Sincerely yours,

William Cochran, Chief
Intermountain Field Operations Center

cc: Director, Office of Environmental Project,
Review, USDI, Washington, D.C.
Regional Environmental Officer,
USDI, Chicago, Ill.

United States Department of Agriculture
Soil Conservation Service
Springer Federal Building
301 N. Randolph Street
Champaign, IL 61820

November 30, 1988

Neil A. Smart, Colonel
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

We have reviewed the Definite Project Report with Integrated Environmental Assessment for the Andalusia Refuge EMP project and have the following concerns:

1. No reference to mitigating the losses of the bottomland hardwoods or wetlands that will be destroyed or potentially destroyed by the project.

2. No reference of the impact to private landowners, i.e., FSA wetlands drained that would permit cropping previously undrained wetlands.

3. How much more sediment reaches the river and sediment effects do not appear to be considered.

Sincerely,

JOHN J. ECKES
State Conservationist

Enclosure

cc:
Rudy Rice, President, AISWCD, DuQuoin, IL
Steve Chard, IDOA, Springfield, IL
Dennis Herrmann, Chairman, Farmland Committee, Edelstein, IL
L. Holtsclaw, AC, A-1

RLM:bn

Illinois Historic Preservation Agency

Old State Capitol • Springfield, Illinois 62701 • (217) 782-4836

217/785-4512

ROCK ISLAND COUNTY
Andalusia EMP Levee Alignment and Stream Realignment
Mississippi River
Andalusia Slough

November 28, 1988

Neil A. Smart, Colonel
District Engineer, US Corps of Engineers
Rock Island District
Clock Tower Building
Post Office Box 2004
Rock Island, Illinois 61204-2004

Dear Sir:

Thank you for the opportunity to comment on the Environmental Assessment of the Andalusia Refuge Rehabilitation and Enhancement Project. Our staff has reviewed this document and has determined that adequate consideration was given to cultural resources in the planning stages of this project. As presently proposed, no significant historic, architectural, and archaeological resources are located within the area to be impacted by construction activities.

If you have any further questions, please contact Ms. Joyce A. Williams, Staff Archaeologist, Illinois Historic Preservation Agency, Old State Capitol, Springfield, Illinois 62701, 217/785-4997.

Sincerely,

Theodore W. Hild
Deputy State Historic
Preservation Officer

TWH:JAW:bv

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333

November 22, 1983

District Engineer
U.S. Army Engineer District
Rock Island
ATTN: Planning Division
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sir:

Thank you for sending the Finding of No Significant Impact (FONSI) for "Andalusia Refuge Rehabilitation and Enhancement." We are responding on behalf of the U.S. Public Health Service. We have reviewed the document and concur with the findings of this report that the described project will not pose extraordinary risks to public health or safety.

Thank you for sending this document for our review. Please insure that we are included on your mailing list for further documents which are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

David E. Clapp

David E. Clapp, Ph.D., P.E.
Environmental Health Scientist
Special Programs Group
Center for Environmental Health
and Injury Control

STATE OF ILLINOIS

OFFICE OF THE GOVERNOR

SPRINGFIELD 62706

JAMES R THOMPSON
GOVERNOR

November 18, 1988

Dept of the Army
Clock Tower Building
P.O. Box 200[illegible]
Rock Island, [illegible]ois 61204-2004

SAI#: 88-11-18-49
REGIONAL# Andalusia Refuge EMP project
TITLE: Dept. of the Army
DEPT.:

The Illinois State Clearinghouse has received a "Notice of Intent" for the above project.

The review of your proposal has begun as required by law. You should receive additional correspondence on this project within 30 days. Please refer to the SAI number in future correspondence on this proposal. For further information call (217)782-1671.

Claudia Lemon
Illinois State Clearinghouse
Room 107 Stratton Building
Springfield, Illinois 62706

Illinois Historic
Preservation Agency

Old State Capitol • Springfield, Illinois 62701 • (217) 782-4836

217/785-4512

ROCK ISLAND COUNTY
Andalusia EMP Levee Alignment and Stream Realignment
Mississippi River
Andalusia Slough

September 7, 1988

James H. Blanchar, P.E.
Acting Chief, Operations Division
District Engineer, US Corps of Engineers
Rock Island District
Clock Tower Building-Post Office Box 2004
Rock Island, Illinois 61204-2004

Gentlemen:

Thank you for requesting comments from our office concerning the possible effects of the project referenced above on cultural resources. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

Our staff has reviewed the Archaeological Survey Short Report submitted by David G. Stanley, President, Bear Creek Archaeology, Inc. of Highlandville, Iowa for the proposed project referenced above.

The Phase I survey and assessment of the archaeological resources appear to be adequate. No archaeological material was recorded within the boundaries of the proposed Andalusia EMP Levee Alignment project area. Accordingly, we have determined, based upon this report, that no significant historic, architectural, and archaeological resources are located in the project area.

Please retain this letter in your files as evidence of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

If you have any further questions, please contact Ms. Paula G. Cross, Staff Archaeologist, Illinois Historic Preservation Agency, Old State Capitol, Springfield, Illinois 62701, 217/785-4997.

Sincerely,

Theodore W. Hild
Deputy State Historic
Preservation Officer

TWH:PGC:bv
cc: Julia A. Hertenstein
Dudley Hanson, CoE, Planning Division
David Stanley

United States Department of the Interior

FISH AND WILDLIFE SERVICE
ROCK ISLAND FIELD OFFICE (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

IN REPLY REFER TO:
COM: 309/793-5800
FTS: 386-5800

August 4, 1988

Colonel Neil A. Smart
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Smart:

This constitutes our draft Fish and Wildlife Coordination Act report on the Andalusia Refuge Habitat Rehabilitation and Enhancement Project, a component of the Upper Mississippi River System Environmental Management Program (EMP). The EMP is authorized by the 1985 Supplemental Appropriation Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). The authority for this report is contained in Section 2 of the Fish and Wildlife Coordination Act of 1958 (Public Law 85-624).

PROJECT DESCRIPTION

The proposed project consists of construction of a levee approximately 8,600 feet in length and up to 110 feet in base width. The structure would provide protection from a 2-year flood event to 130 acres of the refuge, and would provide water level control to the protected area. A pump station with a capacity of 10 cubic feet per second would provide capability to increase or decrease water levels on the area in conjunction with a management plan. Approximately 110,000 cubic yards of material for the levee would be dredged from Dead Slough on the riverward side of the alinement. An additional 48,000 acres of material will also be obtained for the structure from the area to be protected. The dredging will result in 5,400 feet of channel in Dead Slough and 5,100 feet of channel in the protected portion of the refuge. The configuration of channel in the protected area will be designed to provide approximately nine acres of habitat divided among six or more islands, and to facilitate drawdown of water levels. Control structures in the levee would provide egress for fish trapped in the leveed area by flood events. The Dead Slough channel will be opened to Scisco Chute (thence to the main river) in order to provide ingress and egress for fish. The design of the above features is shown on plates 9 through 12 of the Corps' main report.

Andalusia Refuge is located on lands acquired by the Corps of Engineers (Corps) in the 1930's for the Mississippi River Navigation Project. By 1958 management of approximately 67,000 acres of the project between Muscatine, Iowa, and St. Louis, Missouri, had been transferred to the U. S. Fish and Wildlife Service (Service) by general plan and cooperative agreement. About 17,000 acres of these lands have been designated as the Mark Twain National Wildlife Refuge. The remaining 50,000 acres, including the Andalusia Refuge site, have been made available to the adjacent States for wildlife purposes.

The 320-acre Andalusia Refuge is located at approximate River Mile 462 in Pool 16, and is managed by the Illinois Department of Conservation under cooperative agreements with the Service and the Corps. The primary objective of the refuge is to provide feeding and resting habitat for waterfowl and other migratory birds. In that regard, the site is currently the only wildlife management area between the Princeton Wildlife Area at River Mile 507 (managed by the Iowa Department of Natural Resources), and the Louisa Unit of the Mark Twain National Wildlife Refuge at River Mile 410.

FISH AND WILDLIFE RESOURCES

The fisheries resources at Andalusia Refuge consist largely of catfish, carp and buffalo in Dead Slough. High water conditions in Pool 16 temporarily produces conditions that attract bass and other important species to the area. However, sedimentation over the years has reduced normal water depths in the slough to the point that the habitat is choked with duck weed, coontail and similar species. Summer low water levels often result in reduced dissolved oxygen content that can result in fish kills. The slough no longer has an opening to the river except during high water periods, resulting in fish being trapped in the backwater. Boat access for fishermen is also limited to high water periods.

The terrestrial resources on the refuge consist of 236 acres of cottonwoods, silver maple and willow surrounding approximately 150 acres of marsh landward of Dead Slough. The habitat values of the marsh have been greatly reduced over time by sediments accumulating from the uplands adjacent to the refuge. The value of the area to migratory waterfowl, particularly in the fall, is dependant upon the water levels in the Mississippi River. It is not uncommon for fall flood events to inundate a good crop of important food plants to depths that render the area unattractive to most waterfowl species. The excessively shallow summer water depths usually results in less than optimum nesting conditions for wood ducks, mallard and teal. Shallow water also contributes to nest predation during the breeding season, because predator access to nest sites is easier.

The timber on the refuge does not contain a large percentage of mast producers. However, there are areas consisting of older stands of cottonwood, maple and associated species that provide important nesting and feeding habitat for a variety of migratory birds. This type of habitat requires a long period of time to develop, and therefore protection of older timber stands is an important component of the Mark Twain National Wildlife Refuge Master Plan.

Bald eagles are the only federally listed threatened or endangered species that is known to utilize the refuge. The proposed project features should not affect that species.

PROBLEMS AND NEEDS

The current habitat values of Andalusia Refuge are limited by a lack of shallow water, an overabundance of emergent aquatic plant growth, and a lack of water control capability. The proposed project is an attempt to address those deficiencies and provide management flexibility. Sedimentation in Dead Slough has resulted in a greatly reduced fishery, and conditions that invite significant fish kills. The deepening of the slough and creation of an opening to Scisco Chute would address those problems.

Construction of the proposed levee could impact some of the older trees between Dead Slough and the marsh area landward of the levee alinement. Identification of this concern has resulted in the alinement presented in this draft, which minimizes the timber impact.

DISCUSSION

One of the major goals of the North American Waterfowl Plan is to maintain the habitat value of designated areas of international significance to waterfowl. The plan identifies the Upper Mississippi River as one of these specific areas of concern. The proposed project would provide water level management capability for Andalusia Refuge, and thus aid in restoration of the waterfowl values reduced by long-term sedimentation.

The current midcontinent drought conditions also illuminate the critical importance of the Upper Mississippi River to migratory birds when isolated wetland habitats are desiccated. The river pools will serve as a haven to the fall migration flights, and could provide the only significant resting habitat in the region for north bound birds in the spring if the drought persists for several years.

Although operated and maintained by the State, Andalusia Refuge is a component of the National Wildlife Refuge System. Actions that affect habitat on the refuge are subject to the compatibility requirements of the National Wildlife Refuge System Administration Act. Therefore, a compatibility statement will be prepared for inclusion in the Corps' final project report.

CONCLUSIONS AND RECOMMENDATIONS

The Andalusia Refuge Habitat Rehabilitation and Enhancement Project, as currently proposed, should restore and enhance fish and wildlife values on the refuge. The levee and pump station would provide management potential that is currently lacking at the site.

To expedite the approval and construction of this project we recommend:

1. that the final design, in particular the alinement of the levee, be closely coordinated with the Mark Twain National Wildlife Refuge staff to insure compatibility with the refuge master plan;

2. that a draft monitoring plan be developed prior to final project design, and;

3. that preconstruction monitoring of water quality and aquatic biota at the project site be initiated immediately;

We look forward to further coordination with your staff on this project.

Sincerely,

Charles P. Davis
Assistant Field Supervisor

cc: Mark Twain NWR
R.O. AE
R.O. AWR
IL DOC
IA DNR

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
MARK FRECH, DIRECTOR

October 8, 1987

Colonel Neil A. Smart
U.S. Army Engineer District, Rock Island
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Attention: Dudley M. Hanson

Dear Colonel Smart:

With this letter of intent, I wish to commit the Department to operation and management of the Andalusia Refuge project, currently programmed in the Environmental Management Program for the Upper Mississippi River System and identified in the Second Annual Addendum and located on Upper Mississippi River Fish and Wildlife Refuge/General Plan land between river miles 462 and 463 of Pool 16, south of Dead Slough and north of Illinois City, in accordance with Section 906(e) of the 1986 WRDA.

The federal project includes upgrading a natural levee and constructing two additional low water levees, totaling about 7,200 feet in length, which tie into high ground along the south edge of the proposed impoundment. It also includes two 30-inch water control structures, a pump and associated ditching, dredging portions of Dead Slough for deep water fish habitat and rerouting a small tributary.

Upon final acceptance, the Department of Conservation will assume operation and management of the moist soil management area to provide submergent and emergent vegetation habitat for nesting, resting and shallow water feeding by migrating waterfowl. Departmental operation and management will include operation and maintenance of the pumps and water control structures, maintenance of the levee system, and general site management typical of a wildlife refuge.

My staff looks forward to working with your office in completing the project at a reasonable cost.

Sincerely,

Mark Frech

Mark Frech
Director

BD:mib

cc: Don Vonnahme
John Comerio

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING—P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO ATTENTION OF:

September 10, 1987

Planning Division

Mr. John W. Comerio
Director
Office of Planning and Development
Illinois Department of Conservation
Lincoln Tower Plaza
524 South Second Street
Springfield, Illinois 62701-1787

Dear Mr. Comerio:

As you are aware, the Rock Island District is proceeding with design of the Upper Mississippi River System - Environmental Management Program (UMRS - EMP) project for habitat rehabilitation and enhancement at Andalusia Refuge, Illinois. At the time of the November 14, 1986, site visit, Mr. William Donels of your office noted that the State would have to seriously consider whether the operation and maintenance costs related to water level management for waterfowl would be supported by Illinois.

The major elements of the Andalusia Refuge project were set at a coordination meeting held at the District offices on March 4, 1987, with Illinois Department of Conservation, U.S. Fish and Wildlife Service, and Rock Island District personnel. At that time it was explicitly noted that an expression of the State's interest was critical for the District to proceed with design work and that such a statement would be forthcoming. This has been reiterated in subsequent telephone conversations between Mr. Donels and Mr. Andrew Brzewicz of my staff, the District's EMP program manager.

It is essential that the District receive written notice of the State's intentions before funds are expended on additional design work. As noted in the General Plan, dated January 1986, which describes the criteria for EMP projects, your support is a prerequisite for a viable project.

We would also appreciate written notification of the State's willingness to cost-share on the project at Rice Lake, Illinois. Unlike Andalusia Refuge, but like the

project for Peoria Lake for which we have received a letter of your intent, this project does not qualify for 100-percent Federal funding of design or construction.

Should you have any questions about this matter, please telephone Mr. Bruzewicz at 309/788-6361, Ext. 203, or you may write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

ORIGINAL SIGNED BY

Dudley M. Hanson, P.E.
Chief, Planning Division

Copies Furnished:

Mr. Mark Frech
Director
Illinois Department of Conservation
Lincoln Tower Plaza
524 South Second Street
Springfield, Illinois 62701-1787

Mr. Donald Vonnahme
Illinois Department of Transportation
Division of Water Resources
2300 South Dirksen Parkway
Springfield, Illinois 62764

Illinois Department of Conservation
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Michael B. Witte, Director • James C. Helfrich, Assistant Director

December 15, 1986

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division, PD-R
Clock Tower Building
P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Sirs:

Enclosed for your information is our revised Andalusia Refuge Project Scope for the Environmental Management Program. The changes made in this scope reflect the discussions our field staff had with your staff and the U.S. Fish & Wildlife Service staff about what we hope to accomplish at the refuge.

I have also included an estimated project requirement list we utilized to aid us in the development of this scope. Should you have any questions do not hesitate to call us.

Sincerely,

William R. Donels

William R. Donels
Landscape Architect
Division of Planning

BD:mib

cc: Gary McCandless
Bob Thornberry

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
GENERAL PLAN APPENDIX
FOR ENGINEERING AND DESIGN

Andalusia Refuge
Pool 16, Upper Mississippi River
Rock Island County, Illinois

INTRODUCTION

Project Authority

The 1985 Supplemental Appropriations Act (Public Law 99-88) provides authorization and appropriations for an environmental management program for the Upper Mississippi River system that includes fish and wildlife habitat rehabilitation and enhancement. The proposed project would be funded under this authorization.

Project Location

Within the Upper Mississippi Wildlife and Fish Refuge between river mile 462 and 463, immediately south of Dead Slough and north of Illinois City are 256 acres managed by the State of Illinois, Department of Conservation (see attachments 1 and 2).

Resource Problems and Opportunities

Presently, there are no low water control systems located in Pool 16. The construction of a low water control structure system would greatly enhance habitat and its management. The lack of shallow water habitat with submergent/emergent aquatic plants has adversely affected waterfowl, furbearer, and fisheries resources within this pool of the Mississippi River.

Proposed Solution

The proposed project would involve repair of an existing levee and construction of two additional low water levees about 7,200 feet long which would tie into high ground along the south edge of the impoundment to provide 130 acres of refuge area. It would include two 30-inch water control structures and some associated ditching that would accommodate portable pumps.

PROJECT REQUIREMENTS

Estimated Engineering and Design Cost

The estimated costs for the engineering and design project are:

Hydraulic Analysis	$ 2,500
Surveying	8,000
Engineering and Design	17,000
Procurement	2,500
Environmental Assessment	2,000
Coordination/Project Preparation	7,500
Total	$39,500

The engineering and design costs would be 100-percent Federal because the project is on the Upper Mississippi Wildlife and Fish Refuge and because the project's primary purpose is habitat improvement for migratory waterfowl.

The Illinois Department of Conservation has estimated project implementation costs to be $280,000. This cost estimate would be refined during the engineering and design phase.

Compliance with the National Environmental Policy Act of 1969 and other environmental laws and regulations would be documented during the engineering and design phase.

Project Participants

The primary project participants would be the Illinois Department of Conservation, U.S. Fish and Wildlife Service, and the Corps of Engineers.

Project Schedule

It is estimated that the engineering and design phase of this project could be completed within 6 months following receipt of funds.

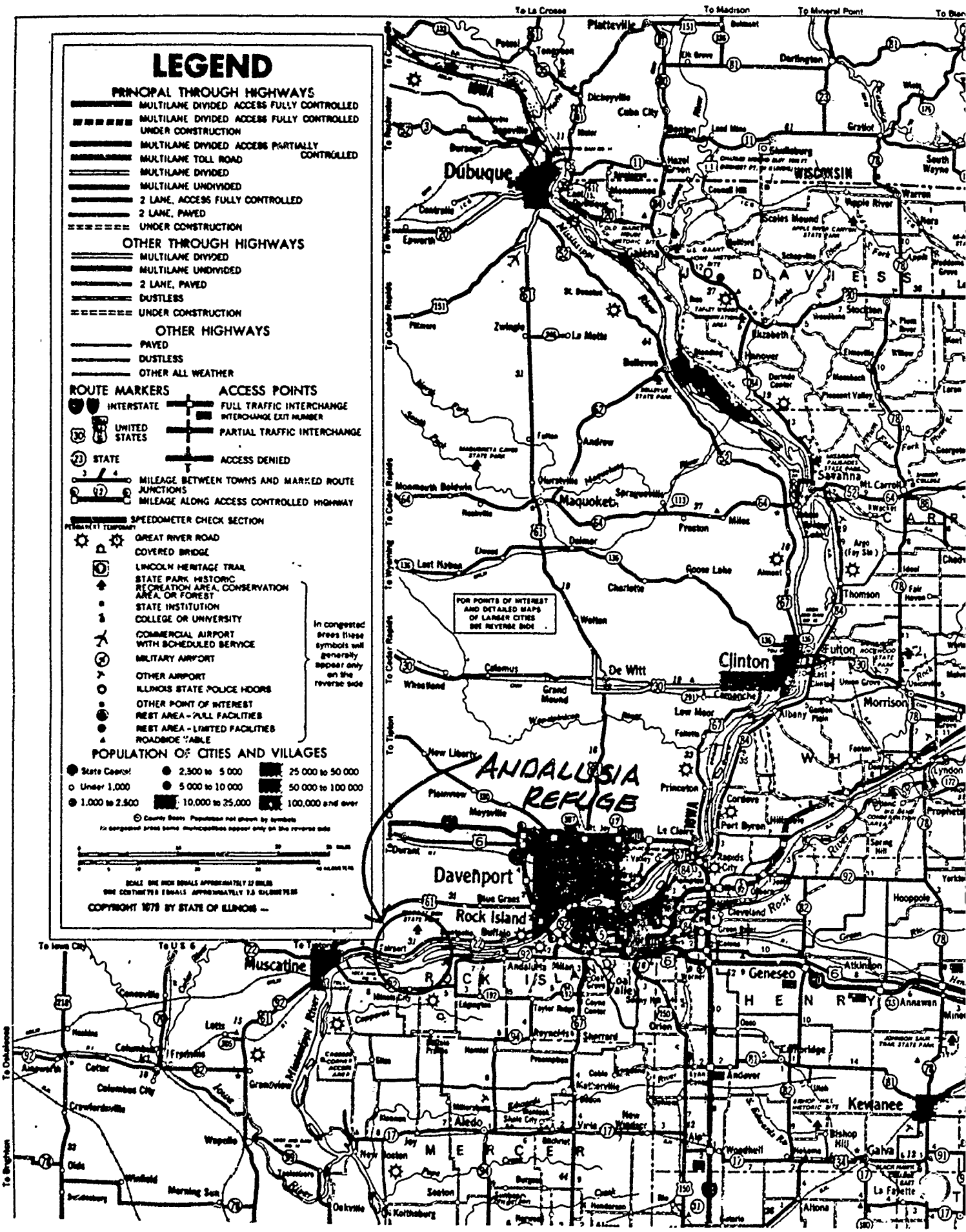
RECOMMENDATION

I recommend that the Secretary of the Army provide $39,500 for engineering and design for the Andalusia Refuge project under the Upper Mississippi River System Environmental Management Program.

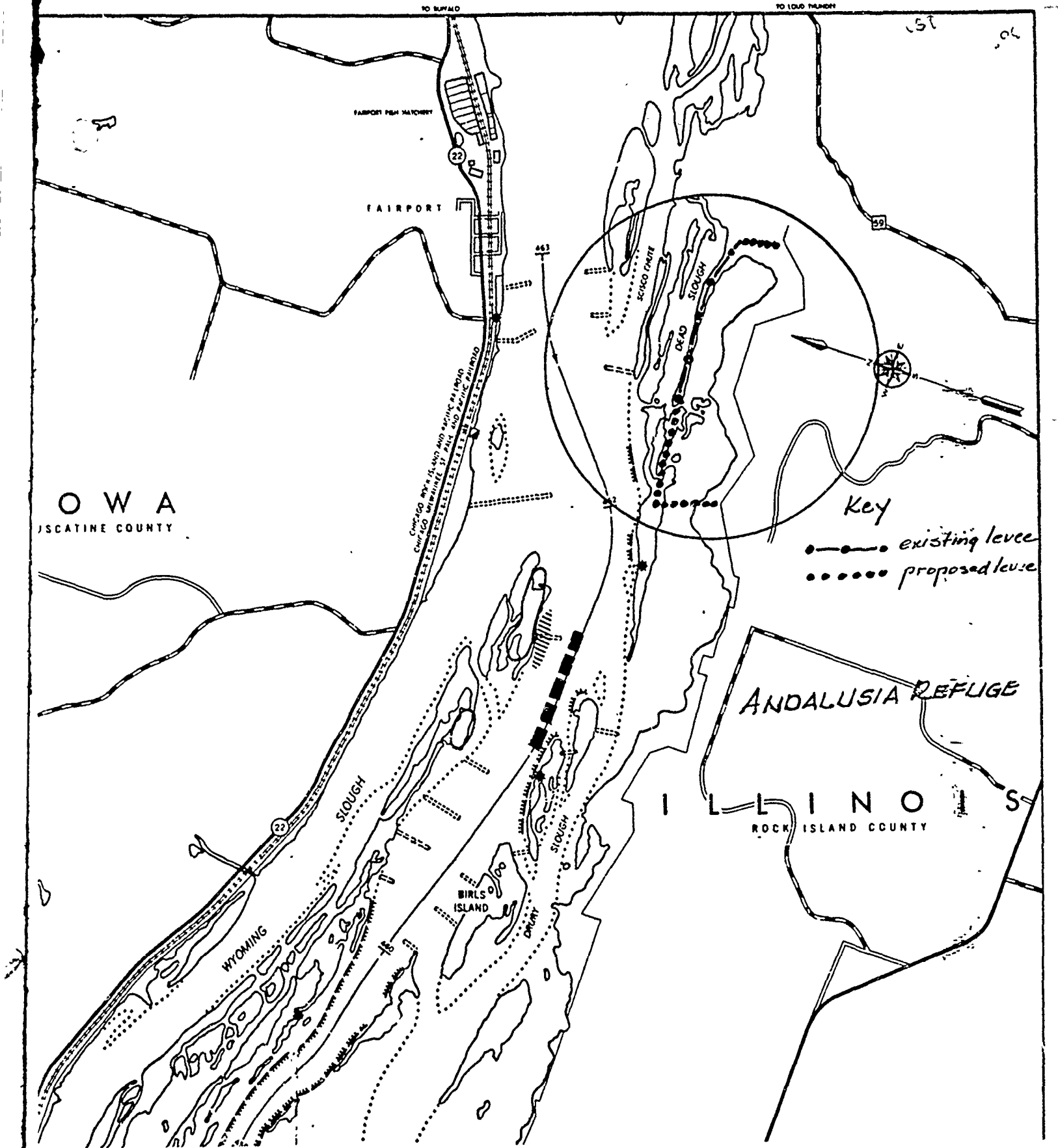
William C. Burns
Colonel, Corps of Engineers
District Engineer

ATTACHMENTS

1. General Area Map
2. Project Area Map



Attachment 1 - Andalusia Refuge
Mississippi River, Illinois Department of Conservation
Proposed habitat enhancement project.



Attachment 2 - Andalusia Refuge
Proposed low levee extensions for shallow water habitat.

Illinois Department of Conservation
life and land together

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Michael B. Witte, Director • James C. Helfrich, Assistant Director

April 17, 1986

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division, PD-R
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

Dear Sirs:

Enclosed is the appendix for the engineering and design of the proposed project at Andalusia Refuge to be part of the Upper Mississippi River System-Environmental Management Program.

If you have any questions or require further information, please contact me.

Sincerely,

William R. Donels

William R. Donels
Landscape Architect
Division of Planning

WRD:sm
Encl.

cc: Gary McCandless
Bill Bertrand
Bob Thornberry

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
GENERAL PLAN APPENDIX
FOR ENGINEERING AND DESIGN

Andalusia Refuge
Pool 16, Upper Mississippi River
Rock Island County, Illinois

INTRODUCTION

Project Authority

The 1985 Supplemental Appropriations Act (Public Law 99-88) provides authorization and appropriations for an environmental management program for the Upper Mississippi River system that includes fish and wildlife habitat rehabilitation and enhancement. The proposed project would be funded under this authorization.

Project Location

Within the Upper Mississippi Wildlife and Fish Refuge between river mile 462 and 463, immediately south of Dead Slough and north of Illinois City are 256 acres managed by the State of Illinois, Department of Conservation (see attachment).

Resource Problems and Opportunities

Presently, there are no low water control systems located in Pool 16. The construction of a low water control structure system would greatly enhance habitat and its management. The lack of shallow water habitat with submergent/emergent aquatic plants has adversely affected waterfowl, furbearer and fisheries resources within this pool of the Mississippi River.

Proposed Solution

The proposed project would involve repair of an existing levee and construction of two additional low water leveed about 7,200' which would tie into high ground along the south edge of the impoundment to provide 130 acres of refuge area. It would include two 12" water control structures and some associated ditching that would accommodate portable pumps.

PROJECT REQUIREMENTS

Estimated Engineering and Design Cost

Estimated engineering and design costs for this project are $43,000 broken down as follows:

1.	Dike condition, topographic and soils surveys	$ 8,000
2.	Design of structures	17,000
3.	Coordination, environmental documentation & review	18,000
4.	Total	$43,000

The engineering and design costs would be 100 percent Federal because the project is on the Upper Mississippi Wildlife and Fish Refuge and

because the project's primary purpose is habitat improvement for migratory waterfowl.

The Illinois Department of Conservation has estimated project implementation costs to be $185,000. This cost estimate would be refined during the engineering and design phase.

Compliance with the National Environmental Policy Act of 1969 and other environmental laws and regulations would be documented during the engineering and design phase.

Project Participants

The primary project participants would be the Illinois Department of Conservation, U.S. Fish and Wildlife Service and the Corps of Engineers.

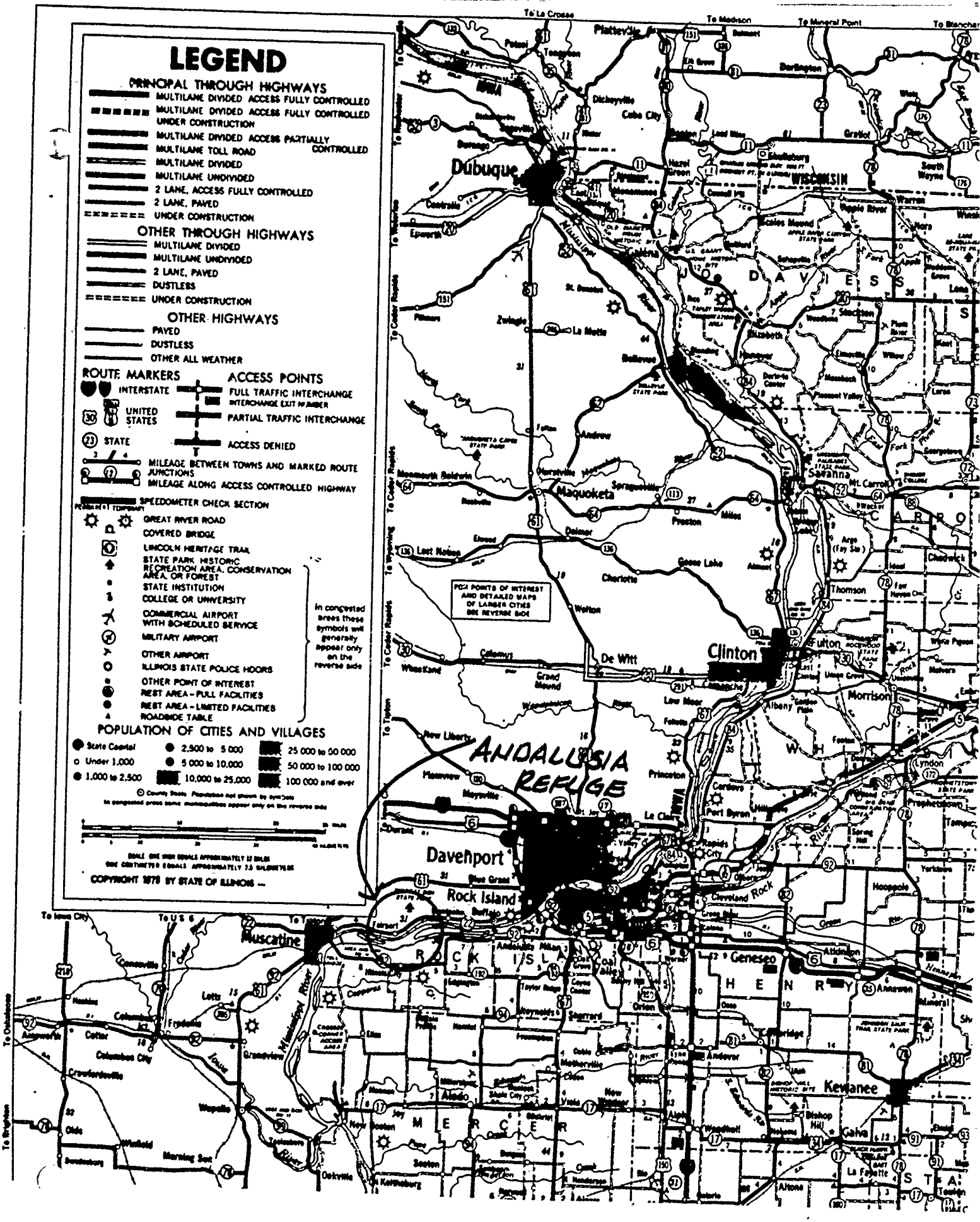
Project Schedule

It is estimated that the engineering and design phase of this project could be completed within 6 months following receipt of funds.

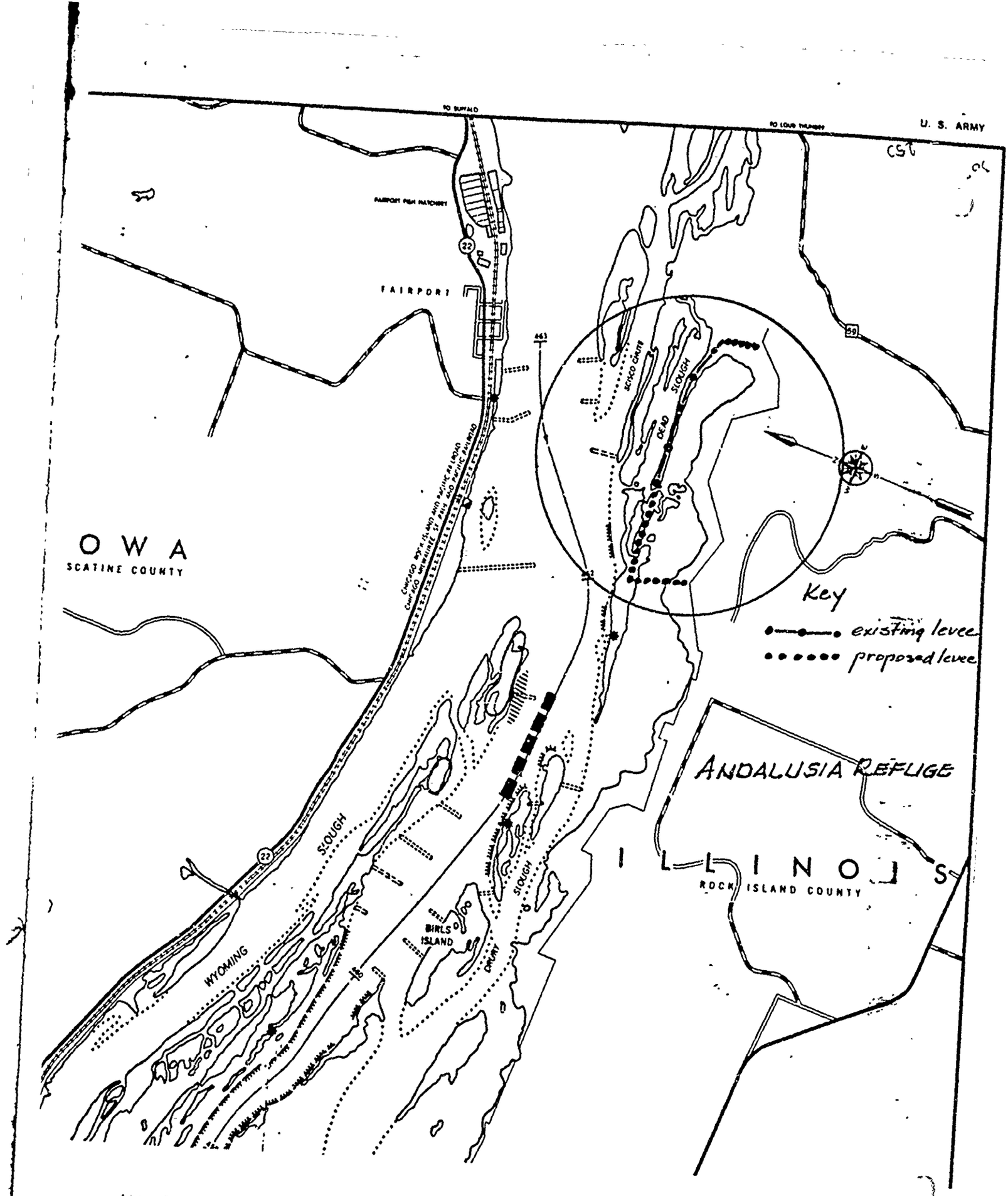
RECOMMENDATION

I recommend that the Secretary of the Army provide $43,000 for engineering and design for the Guttenberg Fish Pond project under the Upper Mississippi River System Environmental Management Program.

William C. Burns
Colonel, Corps of Engineers
District Engineer



Attachment 1 - Andalusia Refuge
Mississippi River, Illinois Department of Conservation
Proposed habitat enhancement project.



Attachment 2 - Andalusia Refuge
Proposed low levee extensions for shallow water habitat.

SECTION 404(B)(1) EVALUATION

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING—P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

CENCR-PD-E

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

ADDITION TO REFUGE HABITAT REHABILITATION AND ENHANCEMENT
POOL 16, UPPER MISSISSIPPI RIVER
ROCK ISLAND COUNTY, ILLINOIS

JANUARY 1989

CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

ANDALUSIA REFUGE HABITAT REHABILITATION AND ENHANCEMENT
POOL 16, UPPER MISSISSIPPI RIVER
ROCK ISLAND COUNTY, ILLINOIS

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CLEAN WATER ACT
SECTION 404(b)(1) EVALUATION

ANDALUSIA REFUGE HABITAT REHABILITATION AND ENHANCEMENT
POOL 16, UPPER MISSISSIPPI RIVER
ROCK ISLAND COUNTY, ILLINOIS

SECTION I - PROJECT DESCRIPTION

A. Location. the project is located in Rock Island County approximately 1 mile north of Illinois City on the Mississippi River, Pool 16, River Miles 462-463.

B. General Description. (See plate 2 and pages 16 through 21 of the main report for details.) The proposed project calls for the construction of a 2-year event levee (elevation 550.8 MSL), 8,600 feet long, surrounding approximately 130 acres of Illinois Department of Conservation (IDOC) refuge land. Water levels within the leveed area will be controlled by pumping. Borrow material for the levee will be mechanically dredged from Dead Slough (approximately 110,000 cubic yards) and from the interior of the newly leveed Refuge (approximately 75,000 cubic yards).

An intermittent stream that now deposits sediment in the Refuge and Dead Slough will be rerouted to Scisco Chute. Approximately 11,700 cubic yards of mostly silt will be excavated to form a new channel 2,430 feet long, 3 feet deep, and 30 feet wide (bottom width). Material will be placed in existing row crop land adjacent to the new channel. The mouth of Dead Slough also will be relocated approximately 1,800 feet upstream in Scisco Chute. Material will be placed on the levee alignment or possibly in nearby agricultural fields. A new access road to the proposed pump station will require filling of approximately 5,000 cubic yards into adjacent river areas.

Alternative out-of-floodplain (upland) fill sites are not feasible for this project. The intent of this project, which is waterfowl and fisheries habitat improvement, requires that it be located in aquatic and wetland habitats. The proposed levee alignment (fill site) minimizes the amount of fill to be placed in these environments.

C. Authority and Purpose. The 1985 Supplemental Appropriations Act (P.L. 99-88) and Section 1103 of the Water Resources Development Act of 1986 (P.L. 99-662) provide authorization and appropriations for an environmental management program on the Upper Mississippi River.

D. General Description of Fill Material. Test borings of the dredged material show it to be predominantly silts and clays.

E. Description of the Proposed Discharge Sites. The proposed discharge site, which is the new levee, occupies approximately 10 total acres. About 7.4 acres of the levee will replace existing bottomland forest. Material excavated from the relocated channel will be placed on existing agricultural

row crop land and (or) spread in adjacent bottomland forest. Plate 2 of the main report shows the location of the proposed discharge site. All material will be mechanically excavated (i.e., backhoe or clamshell).

SECTION II - FACTUAL DETERMINATIONS

A. Physical Substrate Determination.

1. Substrate Elevation and Slope. The proposed levee will raise the existing surface elevation along the alignment from 0 to 7 feet. The east-west levee segment will replace bottomland hardwood forest with an earthen levee. Although the substrate composition will remain much the same, the increased elevation and lack of canopy trees will promote growth of more upland plant types on the levee. The north-south levee tie-off will fill scrub/shrub and emergent/submergent wetland. Substrate composition will be similar, but the elevation will be increased to about 550.8 MSL. This tie-off section also will be armored with rock to prevent levee erosion when flooding occurs. Material excavated from the relocated drainage channel will be placed on adjacent woodland and cropland of similar substrate composition.

2. Sediment Type. The disposal site substrates consist primarily of bottomland soils composed predominantly of silts, clays, and organic soils.

3. Dredged/Fill Material Movement. All material will be placed by physical and mechanical methods that will ensure that it will not be displaced.

4. Physical Effects on Benthos. The composition of the dredged material is very similar to the disposal site substrate.

5. Action Taken to Minimize Impacts. The size and location of the levee minimize the loss of aquatic habitat. The north-south levee tie-off crosses the emergent-submergent wetland at its narrowest location. The levee right-of-way will be approximately 40 to 110 feet wide, minimizing the loss of bottomland forest.

B. Water Circulation, Fluctuation, and Salinity Determination.

1. Water.

a. Salinity - Not applicable.

b. Water Chemistry - The dredged material should not cause any direct change in water chemistry (i.e., pH). Indirectly, as a result of dredging, water quality in Dead Slough should improve due to anticipated higher dissolved oxygen levels in deeper dredged areas. Stagnation in Dead Slough will be eliminated by reopening access to Scisco Chute.

c. Clarity - Water clarity within the leveed area will improve during flood events as long as the levee is not overtopped. The new levee will keep out sediment-laden floodwaters that previously flowed through the Refuge.

d. Color - No effect.

e. Odor - No effect.

f. Taste - No effect.

g. Dissolved Gas Levels - The amount of dissolved oxygen in Dead Slough should increase, particularly in fall and winter months.

h. Nutrients - The dredged material itself will not affect aquatic nutrients. The project will alter nutrient cycles in the Refuge (leveed area). The new levee will reduce nutrient exchange (import and export) to waters contiguous with the Mississippi River. The effect should be negligible.

i. Eutrophication - Indirectly the project should reverse eutrophication in Dead Slough.

2. Current Patterns and Circulation.

a. Current Patterns and Flow - The levee will prevent floodwaters up to the 2-year event (elevation 550.8) from entering the Refuge. The natural flow of water into and out of the Refuge from the downstream end will be blocked. A water control structure in the levee will now permit the flow of water between Dead Slough and the Refuge. The fill material will not affect current patterns and flows outside the Refuge and Dead Slough.

b. Velocity - The new levee may cause some minor increases in velocities since floodwaters that previously flowed through the Refuge will now be diverted.

c. Stratification - No effect anticipated.

d. Hydrologic Regime - The levee will divert flood flows, up to the 2-year event, from entering the Refuge.

3. Normal Water Level Fluctuation. The fill material will have a negligible effect on river stages.

C. Suspended Particulate/Turbidity Determinations.

1. Suspended particulates and turbidity will increase in Dead Slough and the Refuge during dredging and disposal. Some temporary elevation of these parameters also will occur in the Mississippi River main channel when the mouth of Dead Slough is dredged. These suspended particulates and increased turbidity will be predominantly clays and silts.

2. Effects on Chemical and Physical Properties of the Water Column.

a. Light Penetration - Temporary reduction during dredging, but no permanent adverse effects will result.

b. Dissolved Oxygen - The increased turbidity during dredging may cause temporary and localized reductions in D.O.

c. Toxic Metals and Organics - Results of bulk sediment analyses indicate that all organic contaminants were present in concentrations less than their respective detection limits. Toxic metals did exhibit measurable levels for several parameters, however, only nickel and zinc fell in the "moderately polluted" category as established by U.S. EPA Region V draft sediment criteria. Elutriate test results indicate that toxic metal and organic contaminants were quite low and, in most cases, less than their respective detection limits.

d. Pathogens - No effect.

e. Aesthetics - No effect.

3. Effects on Biota.

a. Primary Production - Some primary production from bottomland forest and wetland will be lost due to levee construction. Overall, however, primary productivity within the leveed refuge will increase.

b. Suspension/Filter Feeders - No effect.

c. Sight Feeders - Temporary and localized increases in turbidity may cause some sight-feeding fishes to move to adjacent areas. Effects will be negligible.

D. Contaminant Determinations. Results of ambient water and elutriate tests were compared to Illinois State Water Quality General Use standards. The concentration of ammonia nitrogen in two elutriate samples exceeded the standard of 1.5 mg/l. Also, the concentrations of copper in one elutriate sample and lead in the ambient water exceeded their respective standards of 0.05 and 0.10 mg/l. Results of bulk sediment analyses indicate that ammonia is the only pollutant to occur in concentrations in excess of nonpolluted category based on Interim Guidelines for the Pollutional Classification of Great Lakes Harbor Sediments.

E. Aquatic Ecosystem and Organism Determinations.

1. Effects on Plankton - No effect.

2. Effects on Nekton - There will be little or no direct adverse impacts from fill placement on nektonic organisms such as fish. Indirectly the fisheries of Dead Slough will be greatly improved due to the dredging. Please refer to the Environmental Assessment for a detailed discussion.

3. Effects on Benthos - Adverse impacts on benthos will be negligible. The deepening of Dead Slough and leveeing of the Refuge could cause changes in benthic species diversity locally.

4. Effects on Aquatic Food Web - The proposed fill will inhibit the upper end of the Refuge wetland from freely exchanging nutrients, water, etc. with the main river. Nutrients that otherwise would be transported to other downstream locations during floods will most likely stay within the leveed area. Any effects beyond the Refuge will be negligible.

5. Effects on Special Aquatic Sites.

a. Sanctuaries and Refuges - The proposed discharge will occur in a State-managed waterfowl refuge. At present, the Refuge has no water level management capability. The project will allow biologists to manipulate water levels, thus greatly improving waterfowl food production in the Refuge. The excavation of levee borrow material from Dead Slough will rejuvenate its fishery habitat, which at present acts as more of a detriment. (At low water stages, fish become trapped in the slough with no way of escape.)

b. Wetlands - The entire project area consists of a wetland complex comprised of several classes and subclasses of Palustrine wetlands, such as aquatic bed (rooted vascular, floating vascular, unconsolidated bottom (mud), emergent (persistent), and forested (broadleaf deciduous).

Several of these wetland types will be affected directly and indirectly by the fill. Approximately 18 acres of forested, aquatic bed, and emergent wetland will be filled or cleared. The seasonal water regime of 130 acres of emergent and aquatic bed wetland will become artificially controlled. This artificial water level control will likely cause vegetation diversity to decrease. Annual species such as smartweed (Polygonum spp.) are likely to increase in abundance. Scrub/shrub species around the levee perimeter, such as willow, could decrease in abundance depending upon future water level management practices. The possible decrease in plant diversity and loss of the natural water regime will be exchanged for improved waterfowl feeding and resting habitat.

c. Mudflats - Vegetated mudflats may increase within the leveed Refuge on account of manipulated water levels.

d. Vegetated Shallows - See discussion on wetlands.

e. Coral Reefs - Not applicable.

f. Riffle and Pool Complexes - No effect.

6. Threatened and Endangered Species. The American bald eagle is the only federally endangered or threatened species known to use the project area. Migrating eagles occasionally use the Refuge area during late fall and early winter when ice is not present. During the colder winter months of January and February, eagle use is minimal or nonexistent. The project area

does not provide any critical life requirements for wintering eagles. The proposed fill will have no effect on eagles.

There are no known State-listed endangered or threatened species present on the project site.

7. Other Wildlife - The loss of mast trees along the upland portion of levee alignment will reduce the amount of food available to such wildlife as wood ducks, deer, and squirrel. The levee alignment has been moved riverward into Dead Slough in order to reduce the loss of trees.

F. Proposed Disposal Site Determinations

1. Mixing Zone Determination - Negligible effects.

2. Determination of Compliance with Applicable Water Quality Standards - Water quality standards for Illinois are discussed in Section II, C.2.c. Test results indicate that ammonia nitrogen is the most likely water quality standard which may be violated by the project activity. However, the proposed dredging and disposal methods for material containing all contaminants are expected to minimize contaminant reintroduction to the water column.

3. Potential Effects on Human Use Characteristics.

a. Municipal and Private Water Supply - No effect.

b. Recreational and Commercial Fisheries - Although there will be 130 acres of wetland (used by fish during high water) isolated due to levee construction, the excavation of Dead Slough will create an excellent backwater fish habitat valuable to both recreational and commercial fishermen.

c. Water Related Recreation - The project will create recreational fishing opportunities in Dead Slough where none currently exist. The improved ability of the Refuge to provide quality migratory waterfowl habitat may improve waterfowl hunting opportunities adjacent to the Refuge.

d. Aesthetics - Construction and maintenance of the levee will detract from the natural undisturbed setting that now exists. Increased waterfowl use of the Refuge may improve aesthetics relating to wildlife viewing.

e. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves - No effect.

G. Determination of Cumulative Effects on the Aquatic Ecosystem. A portion of the project is designed to restore aquatic habitat that has been lost to sedimentation since construction of the Nine-Foot Channel project on the UMR. Other projects are proposed, or are under construction, under the authority of Public Law 99-662. These projects contain similar features for

aquatic habitat restoration, rehabilitation, and enhancement on the UMR. It is anticipated that, singly and cumulatively, these projects will contribute to overall aquatic ecosystem improvement throughout the UMR.

H. Determination of Secondary Effects on the Aquatic Ecosystem. No adverse secondary effects will occur to the aquatic ecosystem.

SECTION III - FINDINGS OF COMPLIANCE OR NONCOMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

A. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation. No significant adaptation of the 404(b)(1) guidelines was made in this evaluation.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem. Several alternative levee alignments were studied. The selected alignment minimizes the amount of fill in aquatic and wetland sites. Alternative, out-of-floodplain project locations are not practicable by the very nature of this project. Projects designed to manipulate natural water level fluctuations for the benefit of wildlife must be located in aquatic/wetland environments. There are no practicable alternatives.

C. Compliance With Applicable State Water Quality Standards. Permits, certification, or waiver of certification under Section 401 of the Clean Water Act has been obtained (see Appendix A). The project is in compliance with water quality requirements of the State of Illinois.

D. Compliance With Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act. The disposal will not violate any toxic effluent standards.

E. Compliance With Endangered Species Act, as Amended. The project will have no effect on any federally endangered or threatened species.

F. Evaluation of Extent of Degradation of the Waters of the United States. The proposed project will not affect any municipal or private water supplies. Recreational and commericial fisheries will benefit from the project by the creation of fish habitat in Dead Slough. The project will have no adverse effects on plankton, shellfish, or special aquatic sites. Some wildlife species will suffer minor adverse effects from the loss of some mast-producing trees along the levee alignment. There will be no significant adverse effects to aquatic-dependent wildlife, ecosystem diversity, productivity, and stability. The habitat improvement from this project should benefit recreational opportunities in Pool 16, as well as economics. There will be some loss of aesthetic values due to the construction of the levee.

G. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem. The selected levee alignment will minimize the amount of aquatic and wetland habitat filled.

H. On the basis of the guidelines, the proposed disposal site for the discharge of dredged material is specified as complying with the requirements of these guidelines with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the affected aquatic ecosystem.

13 Feb 89
Date

Neil A. Smart
Colonel, U.S. Army
District Engineer

AGREEMENT FOR OPERATION, MAINTENANCE, AND REHABILITATION

APPENDIX C

ANDALUSIA REFUGE, ILLINOIS

AGREEMENT FOR OPERATION, MAINTENANCE,
AND REHABILITATION

This agreement is to formally consolidate all operation, maintenance, and rehabilitation responsibilities and obligations for the Andalusia Refuge, Illinois, Habitat Rehabilitation and Enhancement Project. It is agreed:

1. Estimated annual operation and maintenance requirements and costs for this project have been outlined in the Definite Project Report, Andalusia Refuge Rehabilitation and Enhancement, dated January 1989.

2. The U.S. Fish and Wildlife Service will assure that operation and maintenance requirements of the project as defined in the Definite Project Report will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986.

3. The non-Federal sponsor of the project, the Illinois Department of Conservation, has agreed to cooperate with the U.S. Fish and Wildlife Service to assure that operation and maintenance will be accomplished in accordance with Section 906(e) of the Water Resources Development Act of 1986.

4. The U.S. Army Corps of Engineers will be responsible for any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

Neil A. Smart Colonel, Corps of Engineers District Engineer	James C. Gritman Regional Director U.S. Fish and Wildlife Service
Date	Date

APPENDIX D

DISTRIBUTION LIST

DISTRIBUTION LIST
FOR
DEFINITE PROJECT REPORT
WITH ENVIRONMENTAL ASSESSMENT AND
SECTION 404(b)(1) EVALUATION
ANDALUSIA REFUGE REHABILITATION AND ENHANCEMENT
POOL 16, MISSISSIPPI RIVER MILES 462-463
ROCK ISLAND COUNTY, ILLINOIS 1/

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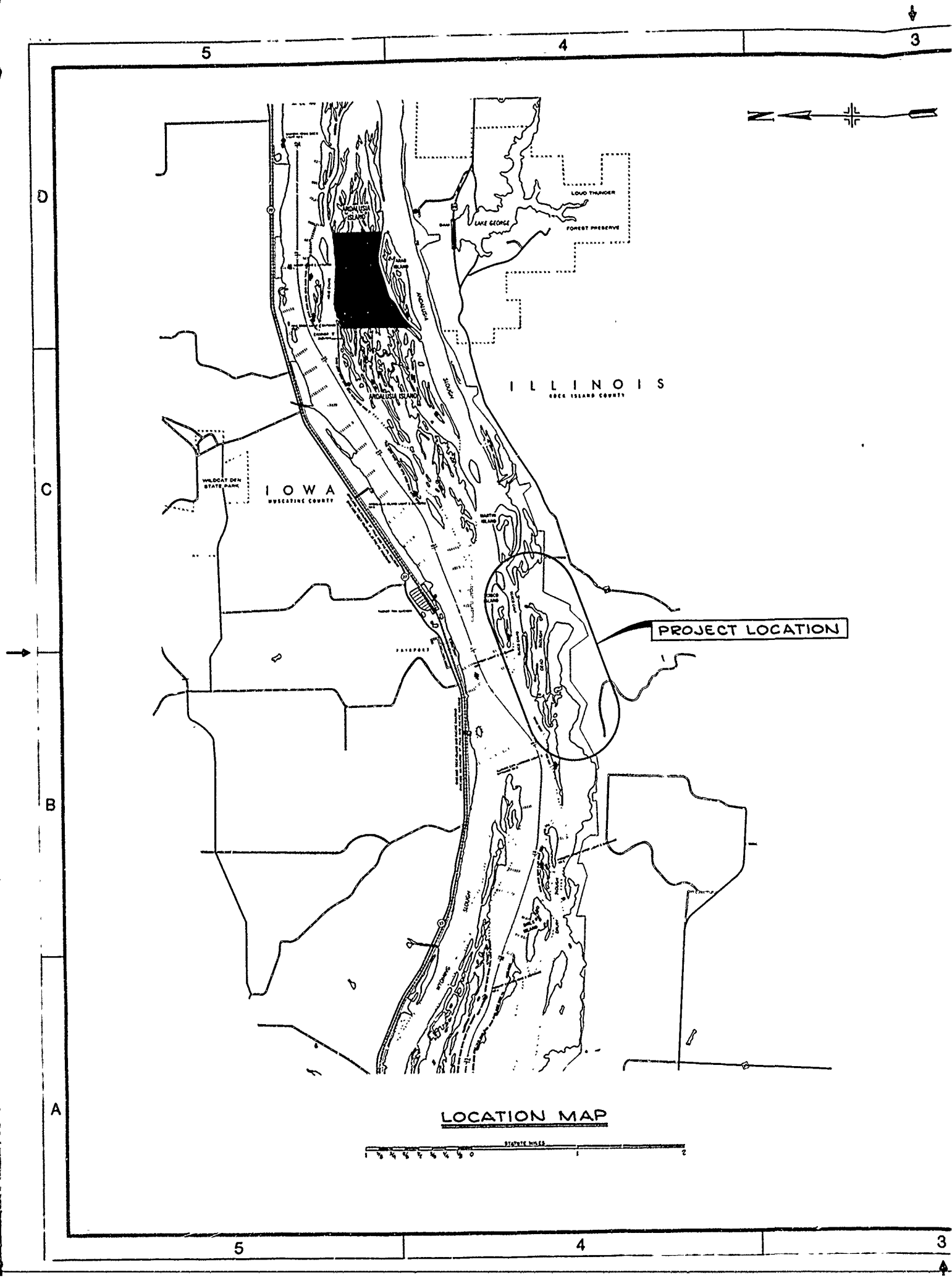
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ILLINOIS
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IOWA
MUSCATINE COUNTY
ANDALUSIA ISLAND
LAKE GEORGE
LOUD THUNDER
FOREST PRESERVE
WILDCAT DEN STATE PARK
PROJECT LOCATION
LOCATION MAP
STATUTE MILES

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5	HYDRAULIC DATA I
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7	BORING LOGS
8	PLAN STA. 12+21.59C to STA. 11+00
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10	PLAN STA. 20+00 to STA. 43+40
11	PLAN STA. 43+40 to STA. 18+00CE
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13	PLAN STA. 19+00W to STA. 33+24.65W
14	PLAN STA. 34+50CE to STA. 0+00F
15	PROFILES I
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23	SEDIMENTATION AND MONITORING PLAN
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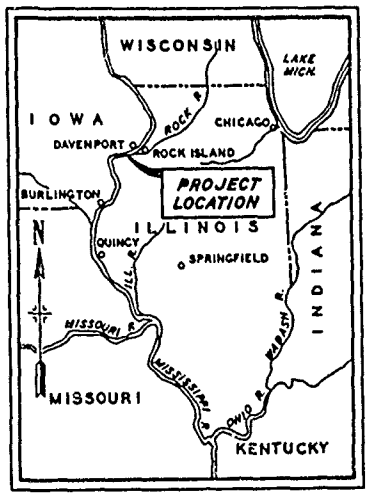

VICINITY MAP

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SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET AS INDICATED ON EACH INDIVIDUAL TITLE BLOCK

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U.S. ARMY ENGINEER DISTRICT, ROCK ISLAND

Submitted by:
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CHIEF, HYDRAULICS BR.

CHIEF, GEOTECHNICAL BR.

Recommended by:

CHIEF, ENGINEERING DIV.

Approved by:

COL, CORPS OF ENGINEERS Date:

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:

Drawn by:

Checked by:

Reviewed by:

Approved by:

US Army Corps of Engineers

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

LOCATION MAP

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Date:

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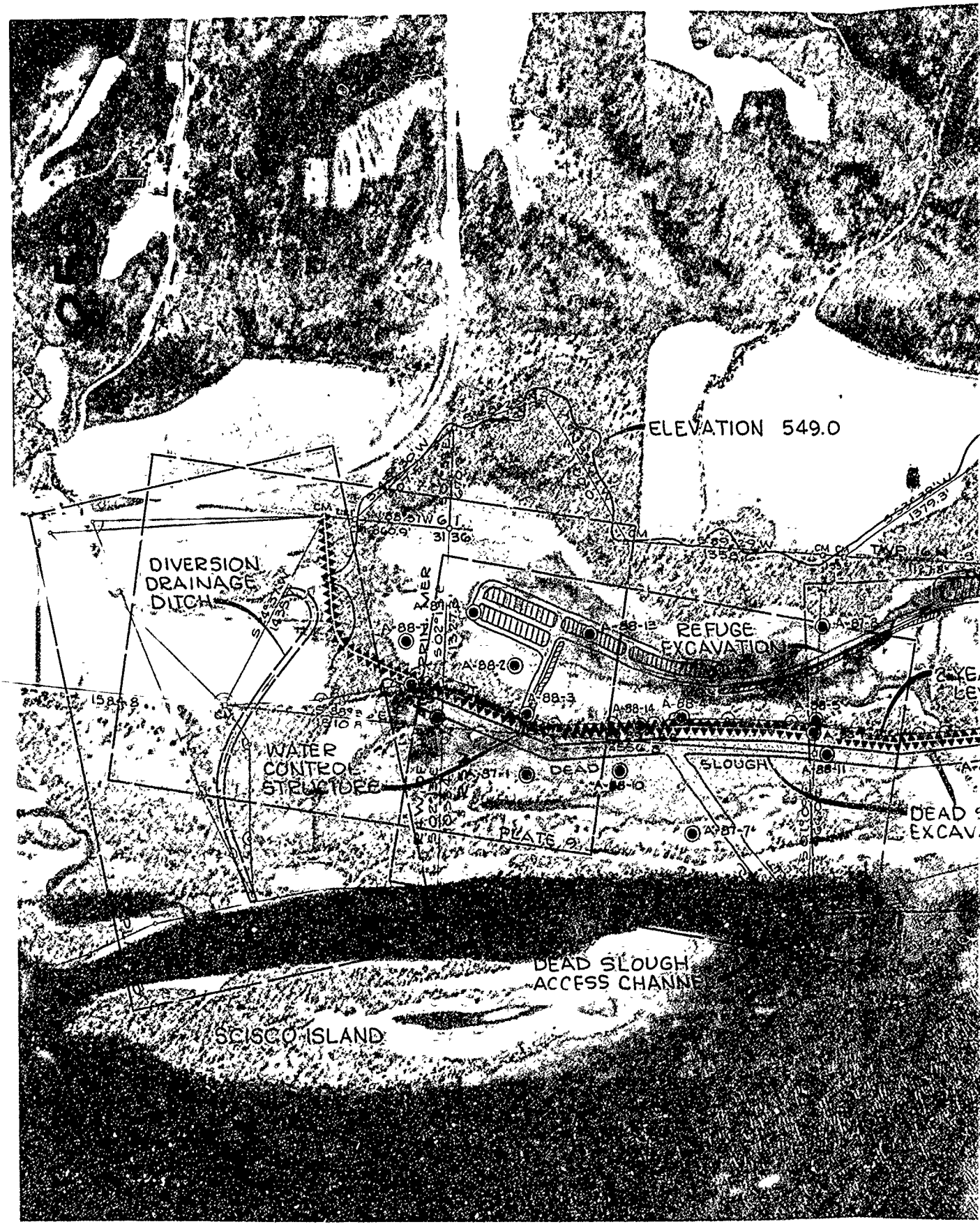
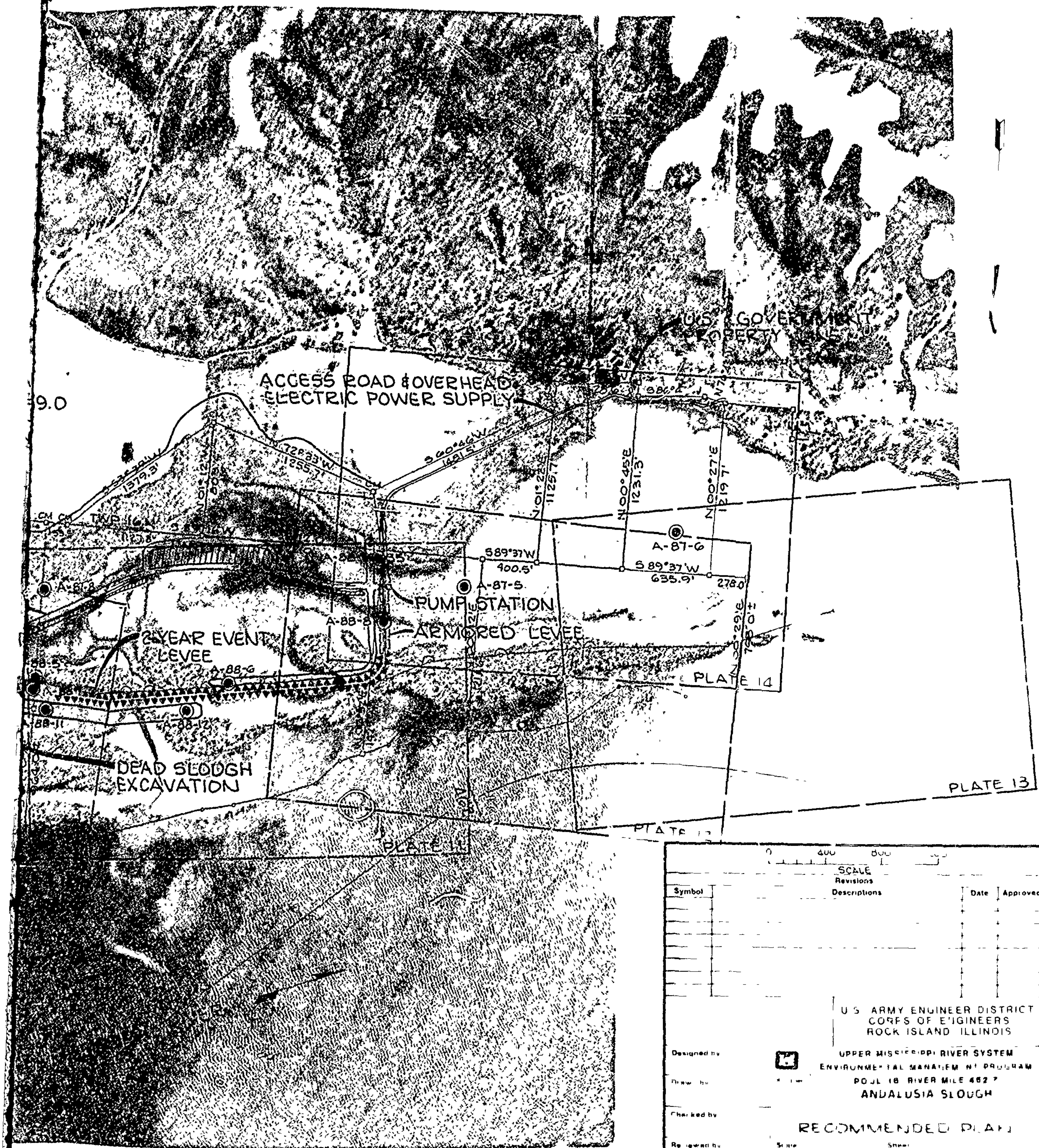
Sheet _ _ of _

PLATE 1


ELEVATION 549.0
DIVERSION DRAINAGE DITCH
REFUGE EXCAVATION
WATER CONTROL STRUCTURE
DEAD SLOUGH ACCESS CHANNEL
SCISCO ISLAND
SLOUGH
PLATE 9



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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16 RIVER MILE 462.[illegible]
ANDALUSIA SLOUGH

RECOMMENDED PLAN

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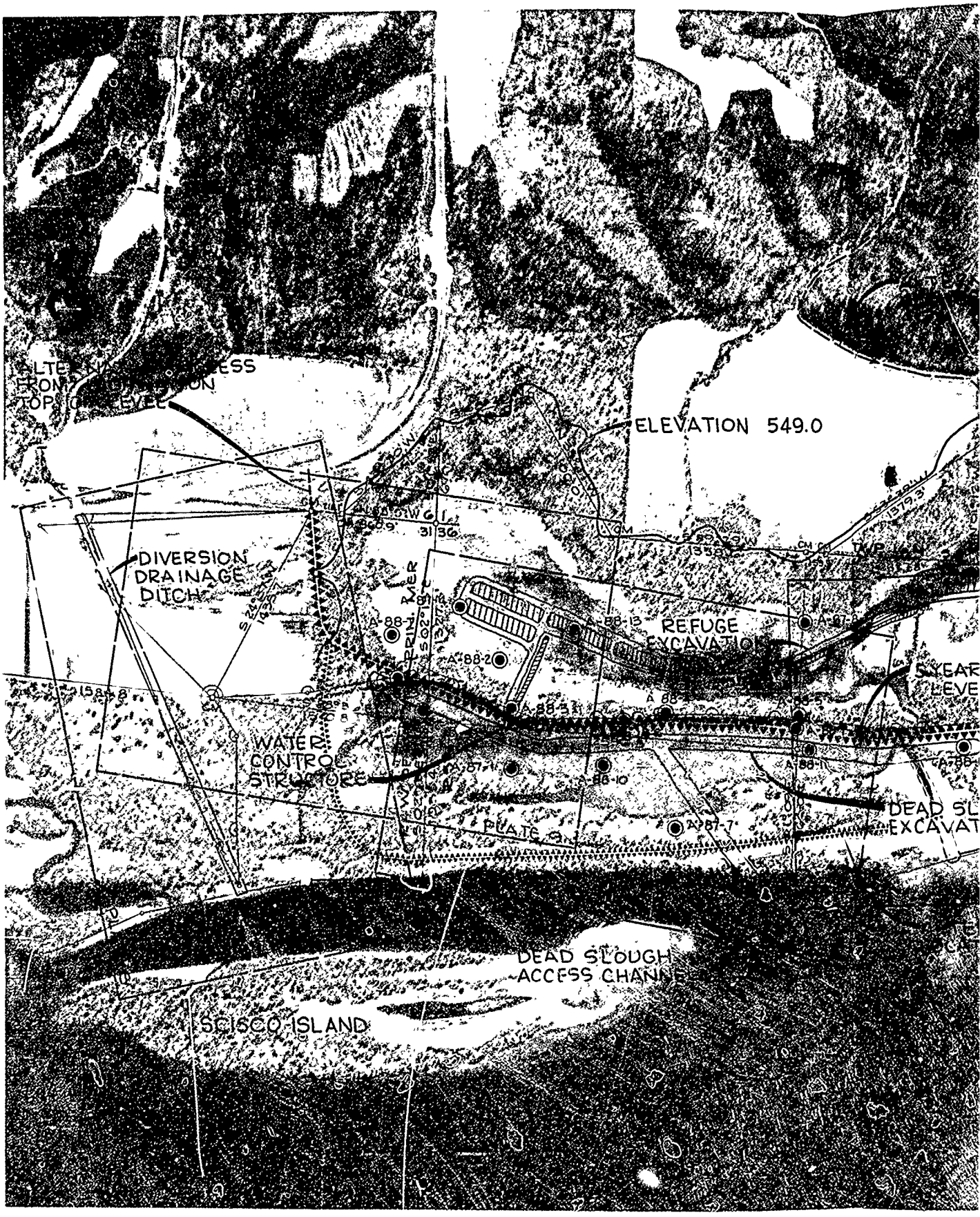
PLATE 2


ELEVATION 549.0
DIVERSION DRAINAGE DITCH
WATER CONTROL STRUCTURE
REFUGE EXCAVATION
DEAD SLOUGH ACCESS CHANNEL
SCISCO ISLAND
PLATE 9
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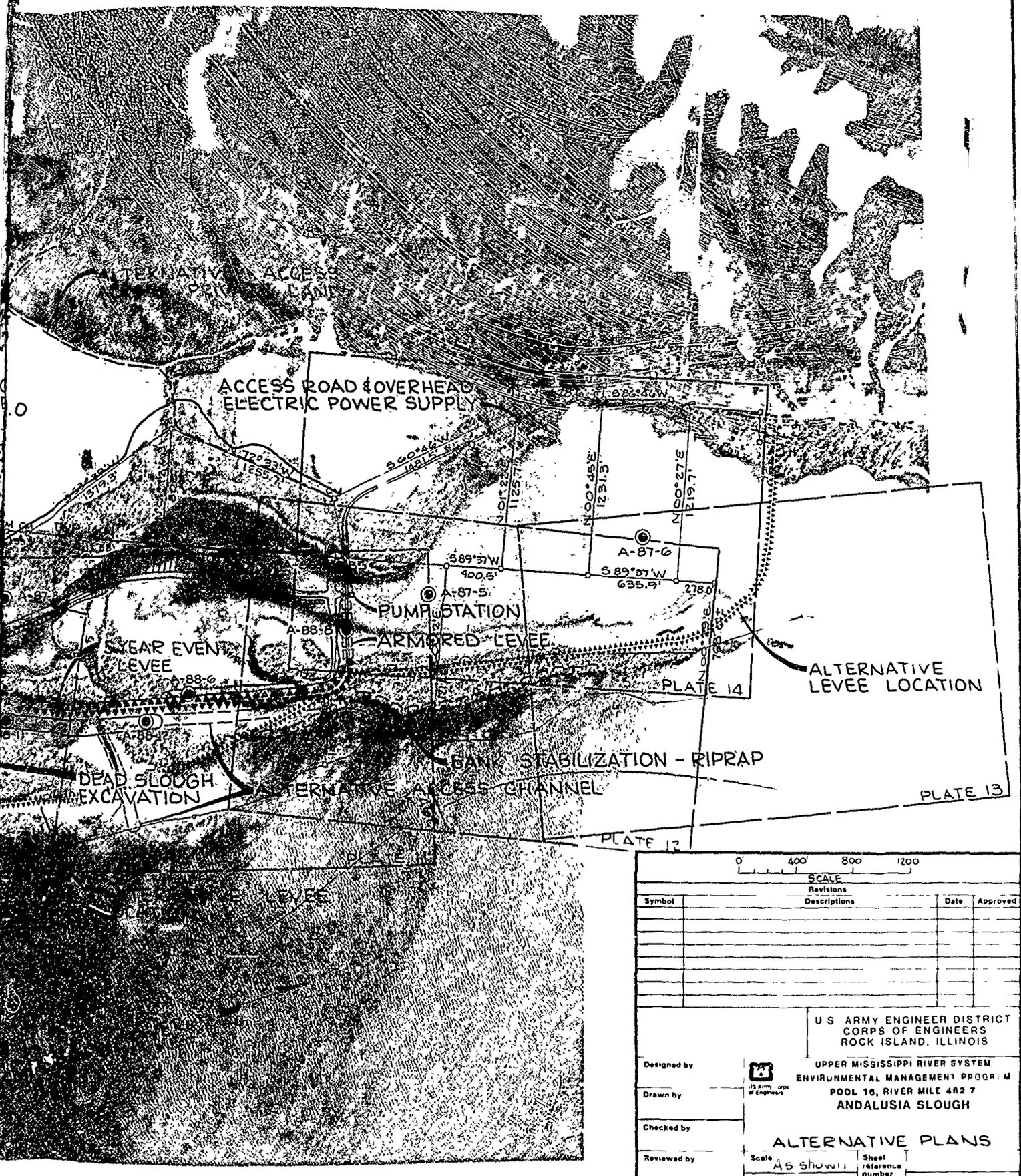

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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

ALTERNATIVE PLANS

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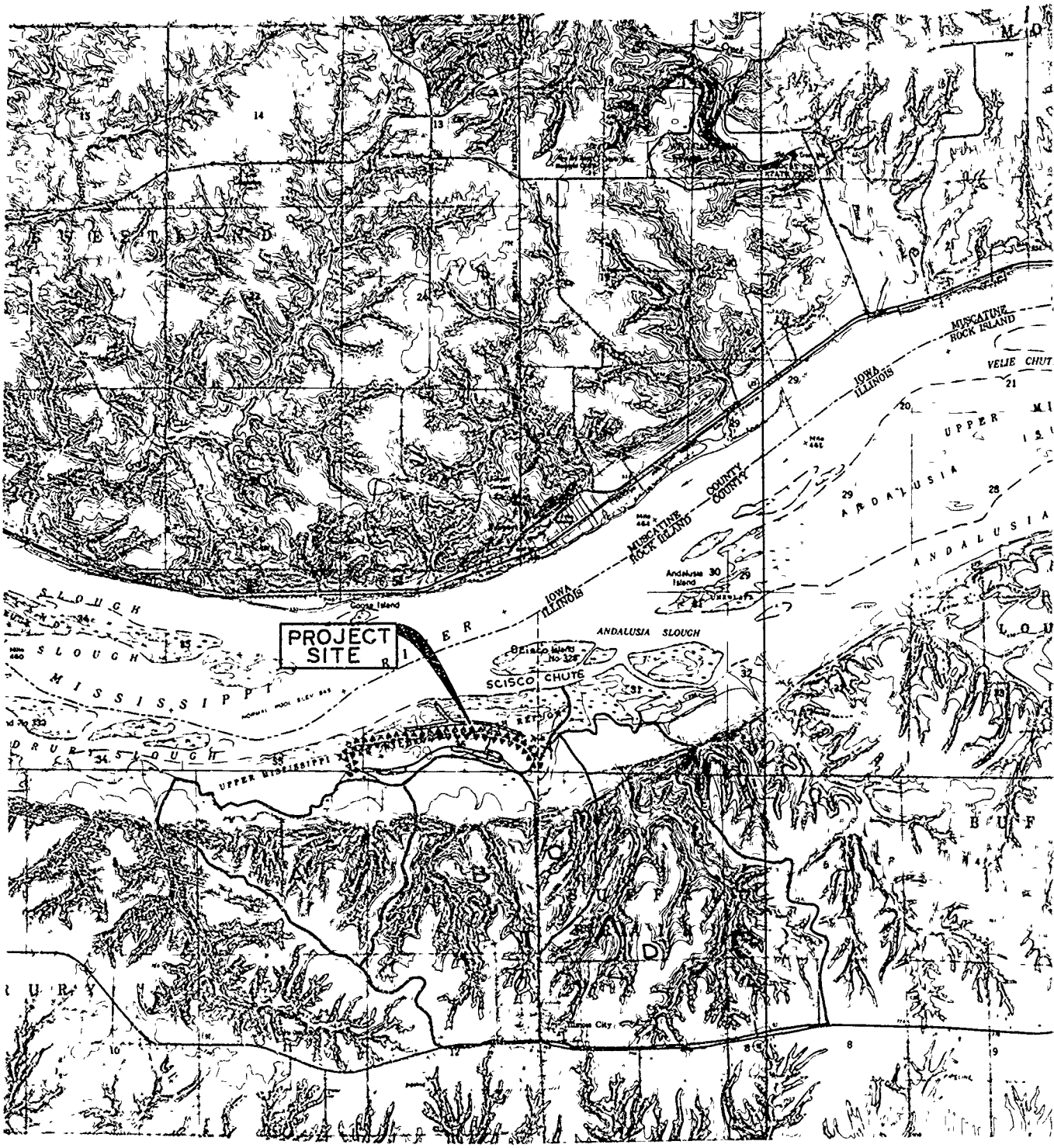
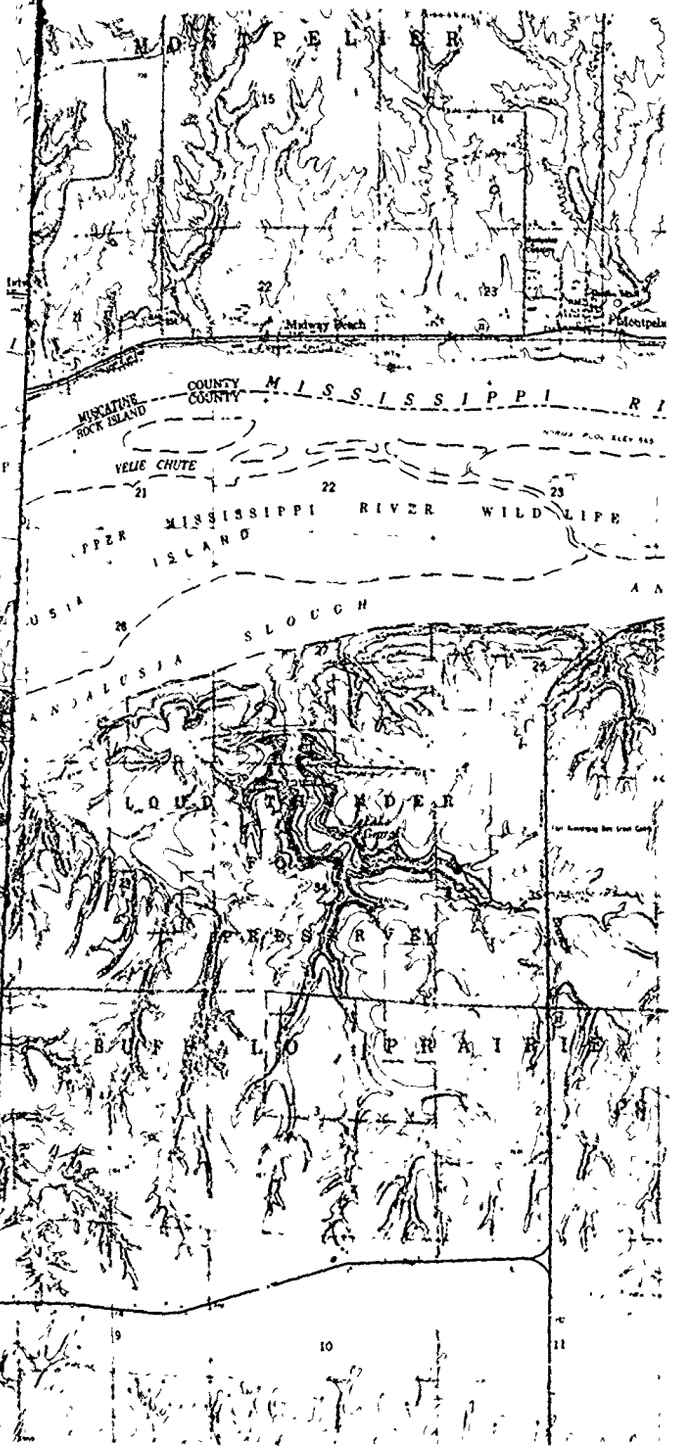
PLATE 3



ADJACENT WATERSHEDS



ADJACENT WATERSHED CHARACTERISTICS

Watershed	Area, acres	Sediment Yield, AC-FT/Year
A	519	2.2
B	774	3.8
C	208	0.8
D	1152	4.2

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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

ADJACENT WATERSHEDS

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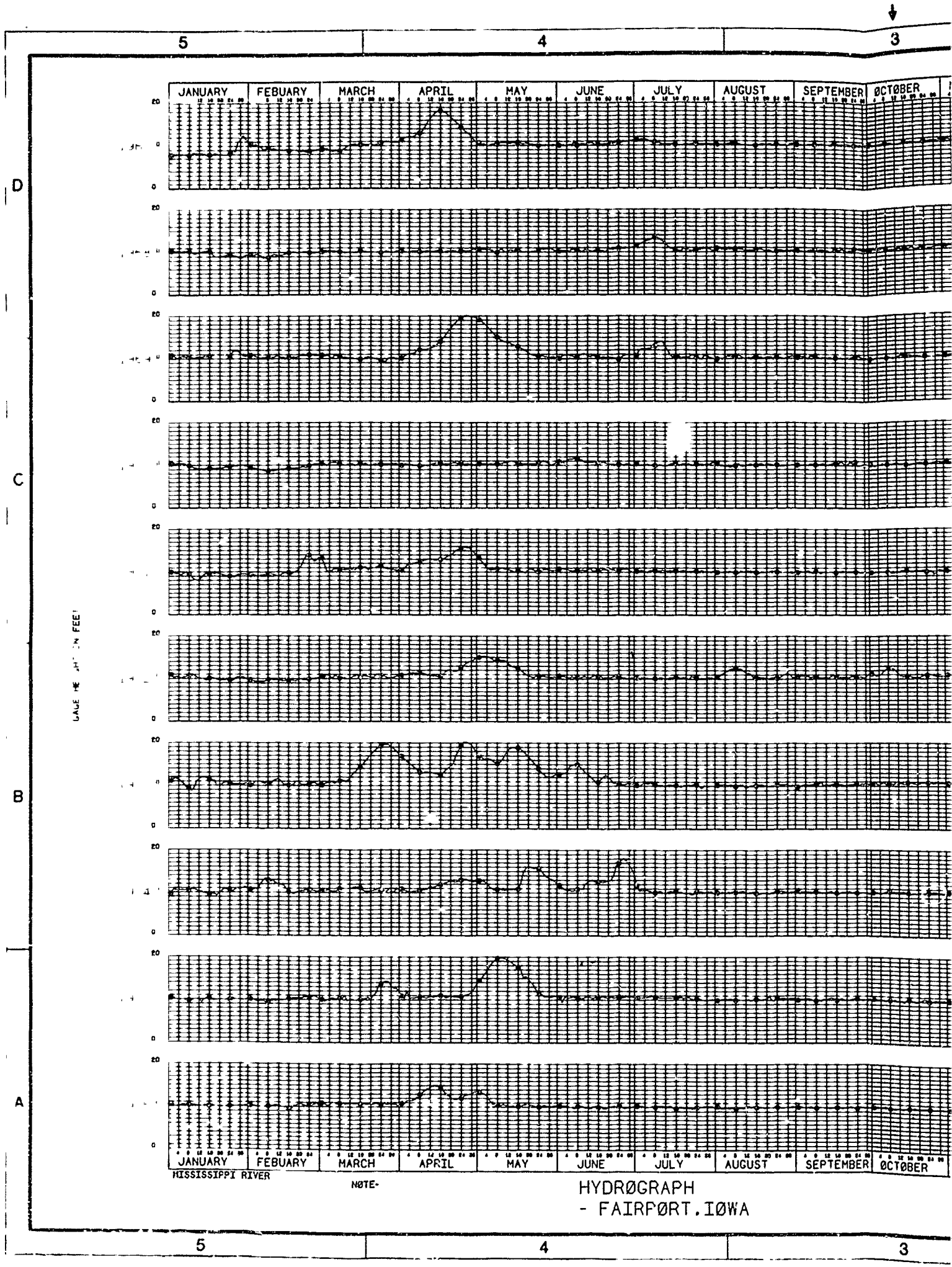
Sheet _ of _

PLATE 4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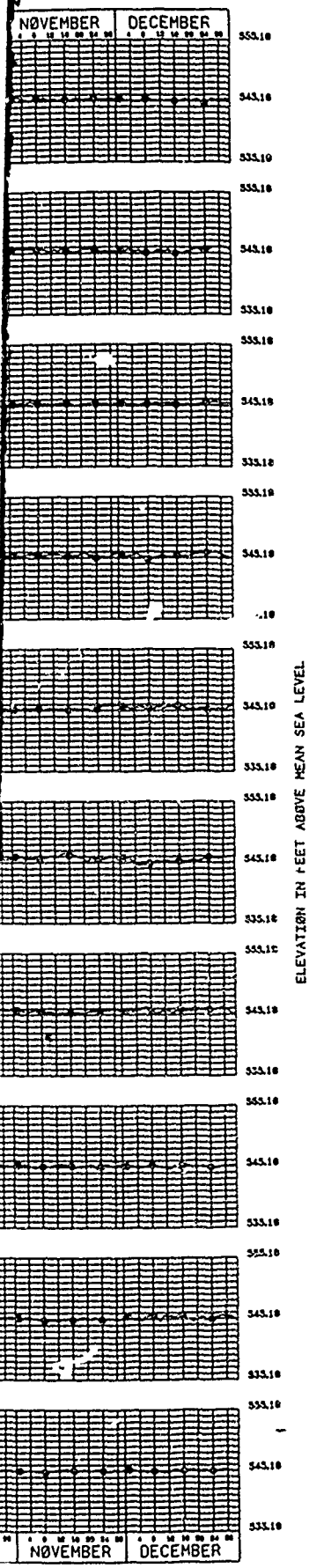

FLOOD PROFILES AT FAIRPORT, IOWA
River Mile 463.5

Event	Elevation
1.5	549.0
2	550.8
5	553.0
10	554.8
50	558.7
100	559.8

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7.
ANDALUSIA SLOUGH

HYDRAULIC DATA I

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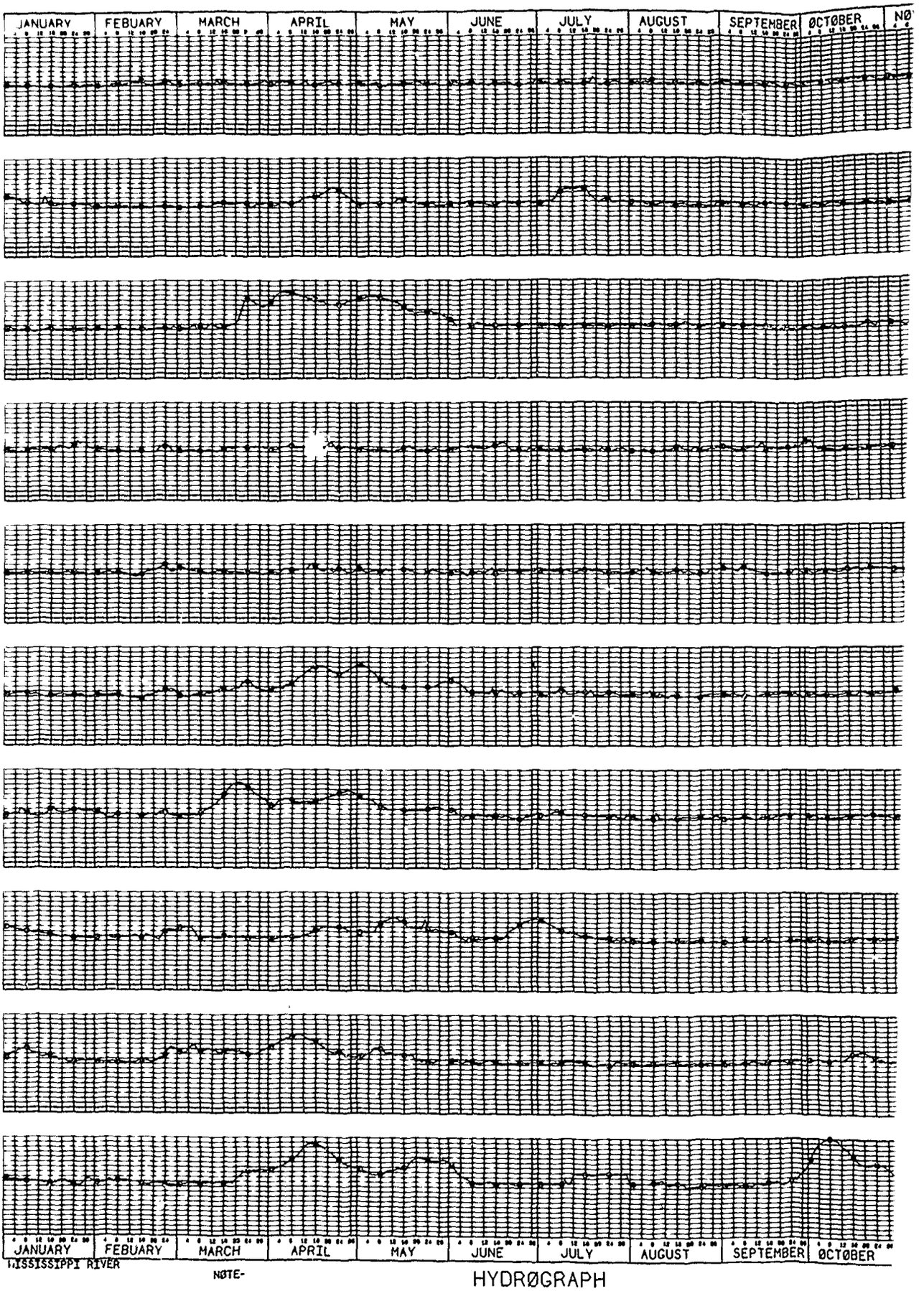
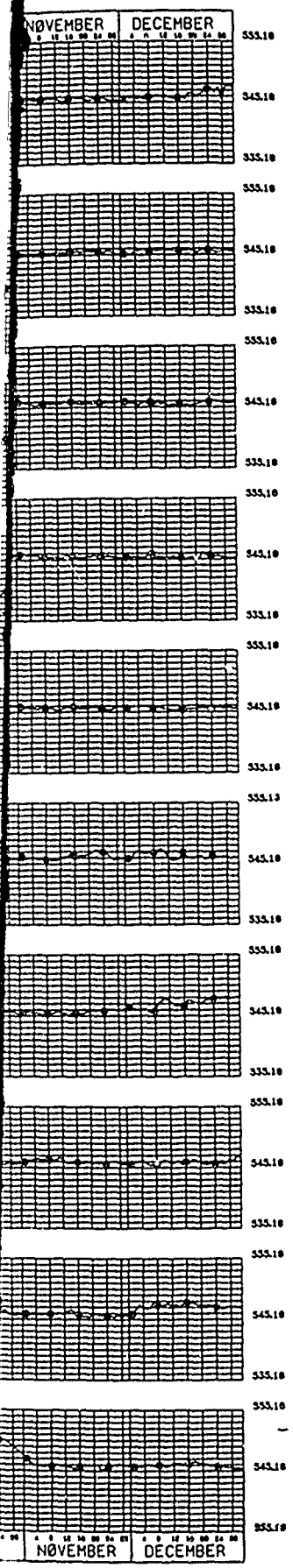
Sheet _ _ of _

PLATE 5



NØTE-

HYDRØGRAPH
- FAIRPØRT.IØWA



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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

HYDRAULIC DATA II

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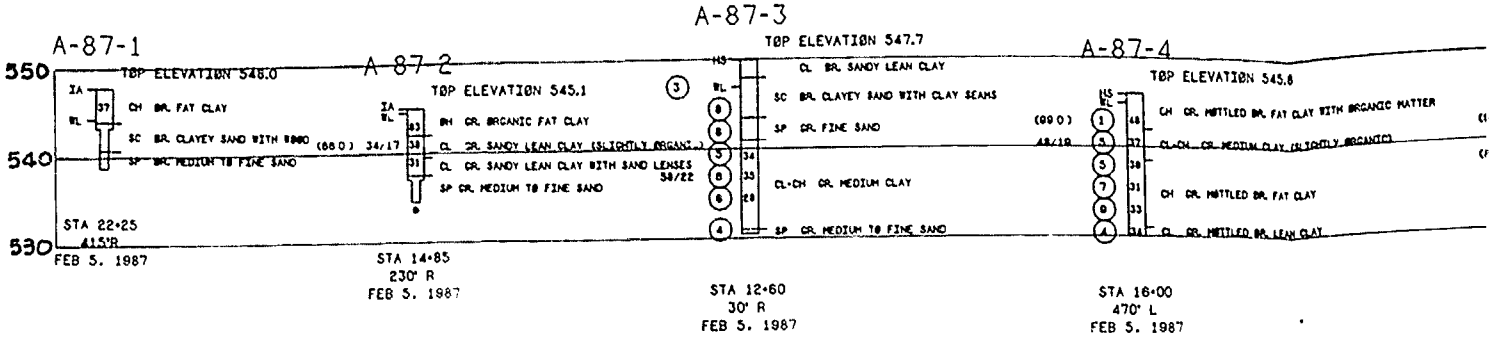
Sheet _ _ of _

PLATE 6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TOP ELEVATION 546.0
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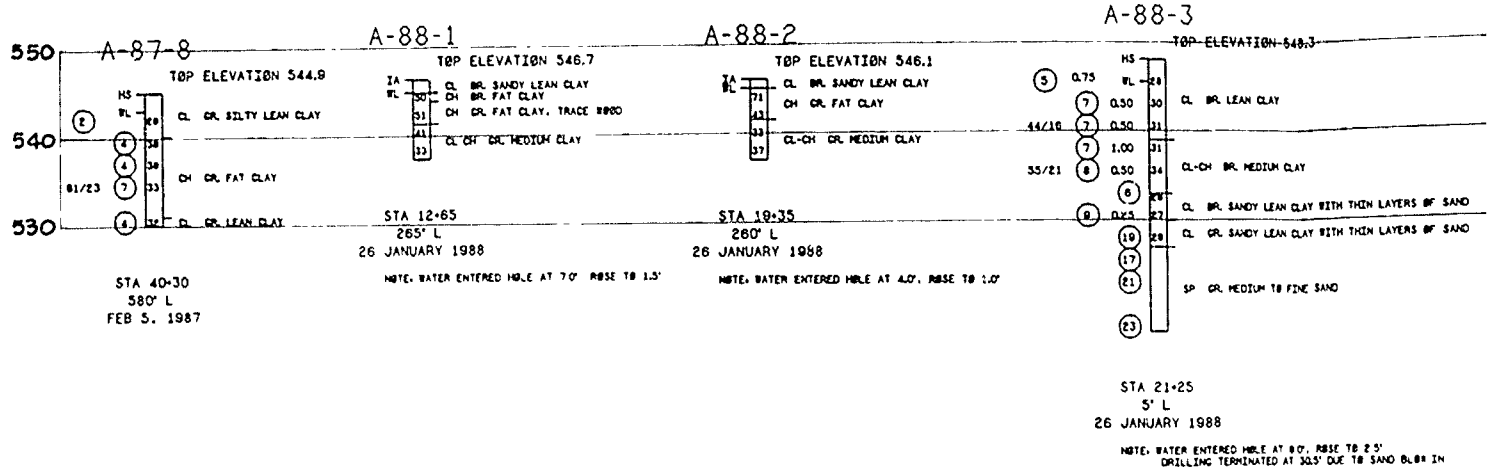
TOP ELEVATION 545.1
A-87-3
TOP ELEVATION 547.7
A-87-4
TOP ELEVATION 545.8
550
540
530
STA 22+25
41.5' R
FEB 5. 1987
STA 14+85
230' R
FEB 5. 1987
STA 12+60
30' R
FEB 5. 1987
STA 16+00
470' L
FEB 5. 1987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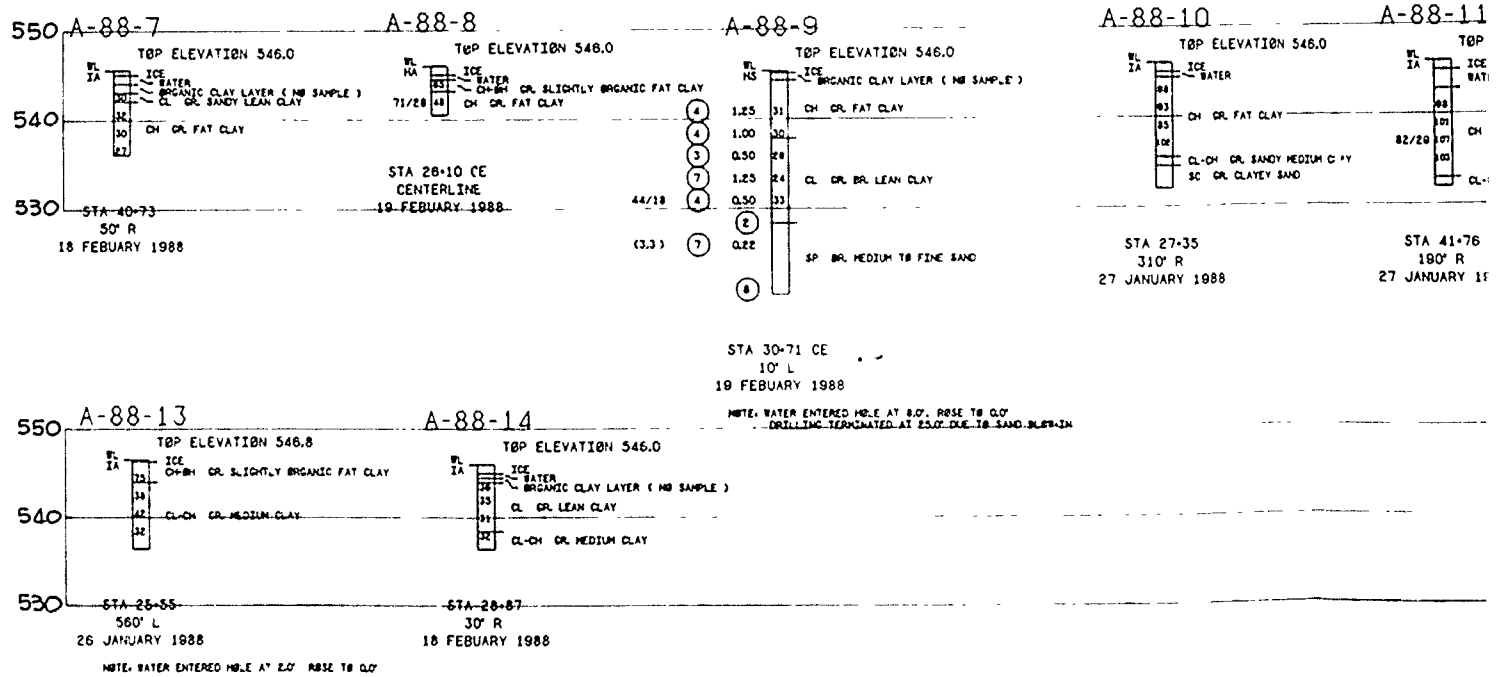
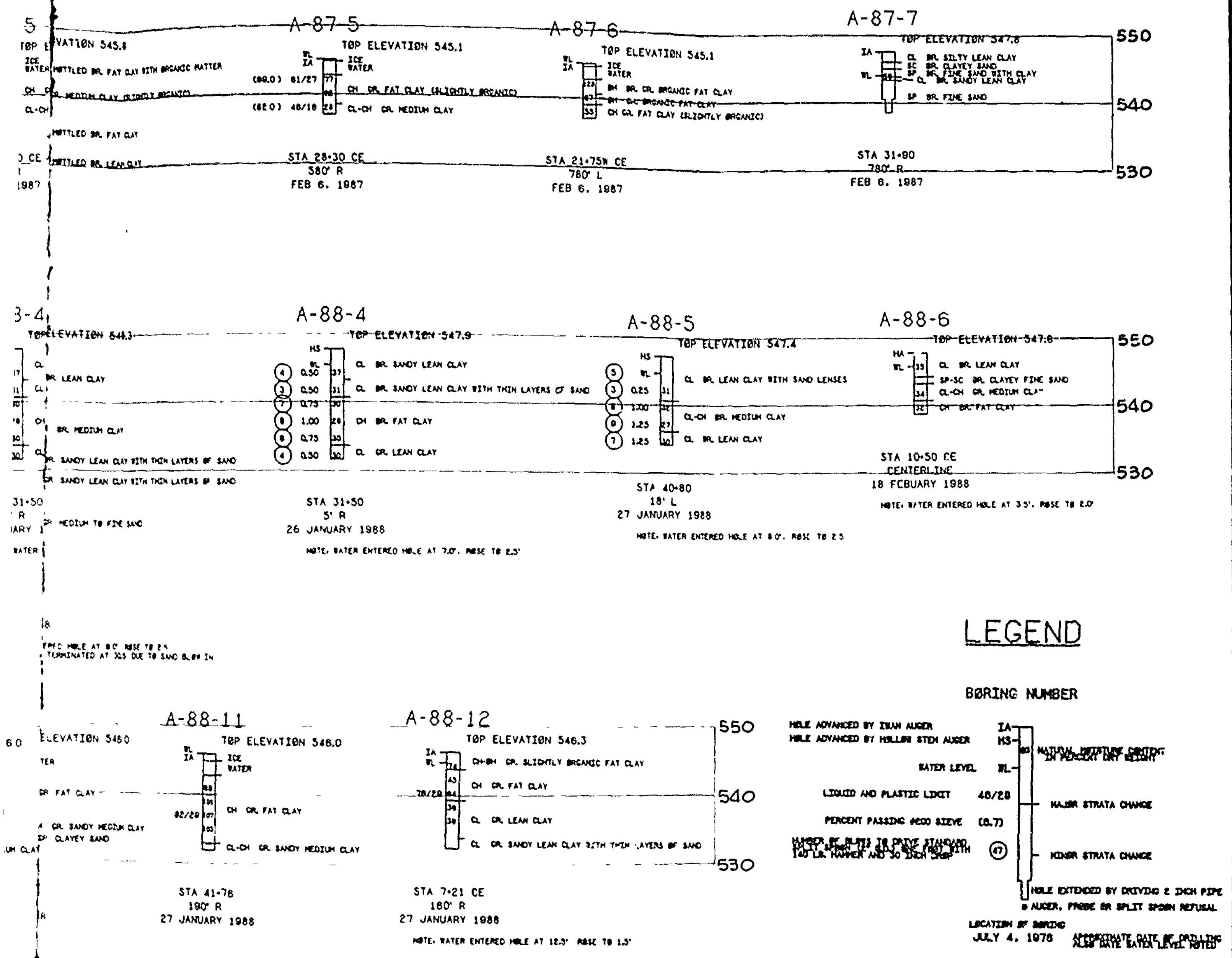
TOP ELEVATION 544.9
A-88-1
TOP ELEVATION 546.7
A-88-2
TOP ELEVATION 546.1
A-88-3
TOP ELEVATION 548.3
550
540
530
STA 40+30
580' L
FEB 5. 1987
STA 12+65
265' L
26 JANUARY 1988
STA 19+35
260' L
26 JANUARY 1988
STA 21+25
5' L
26 JANUARY 1988


A-88-7
TOP ELEVATION 546.0
A-88-8
TOP ELEVATION 546.0
A-88-9
TOP ELEVATION 546.0
A-88-10
TOP ELEVATION 546.0
A-88-11
550
540
530
STA 40+73
50' R
18 FEBUARY 1988
STA 28+10 CE
CENTERLINE
19 FEBUARY 1988
STA 30+71 CE
10' L
19 FEBUARY 1988
STA 27+35
310' R
27 JANUARY 1988
STA 41+76
190' R
27 JANUARY 19

A-88-13
TOP ELEVATION 546.8
A-88-14
TOP ELEVATION 546.0
550
540
530
STA 25+55
560' L
26 JANUARY 1988
STA 28+87
30' R
18 FEBUARY 1988



Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

US Army Corps of Engineers

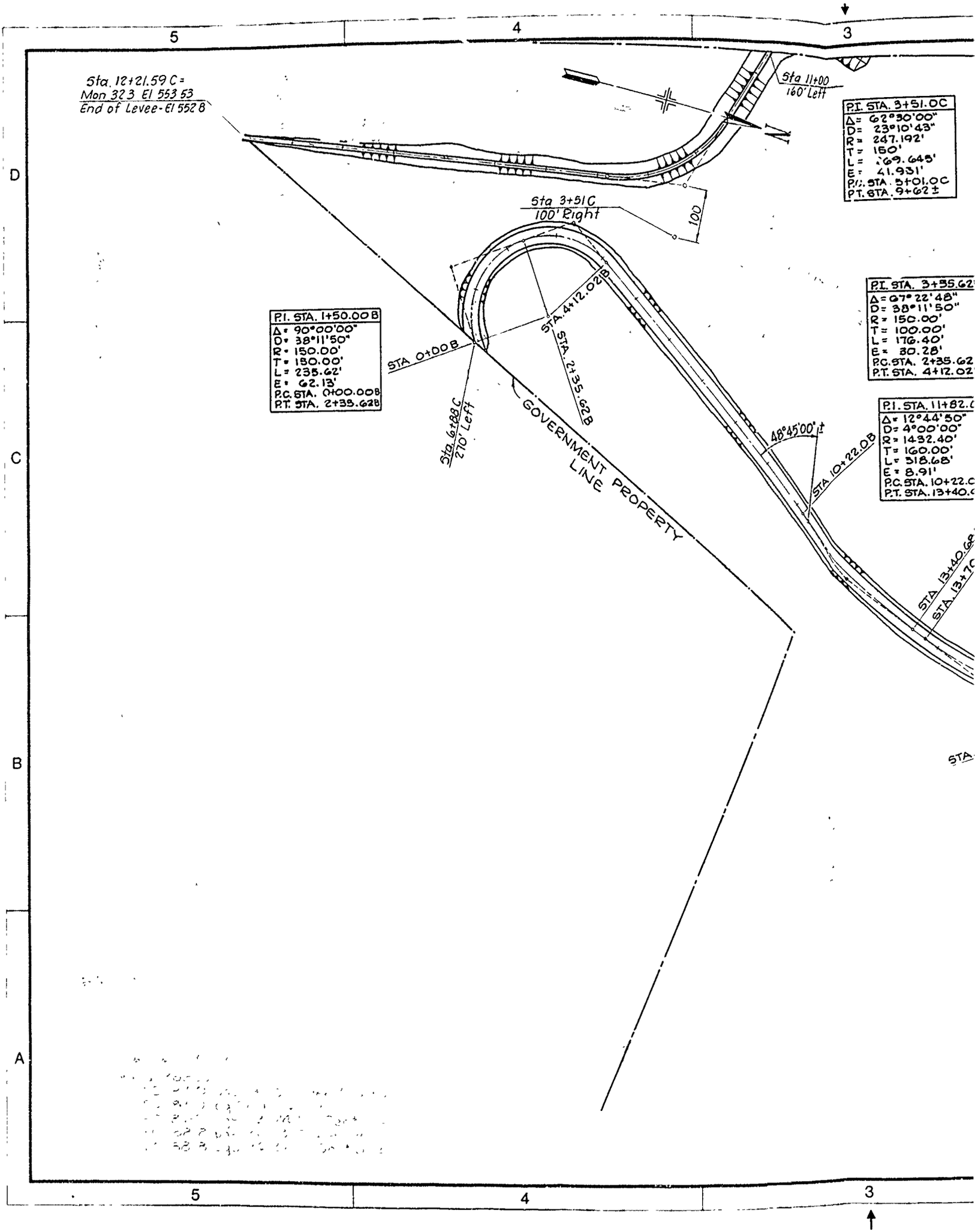
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

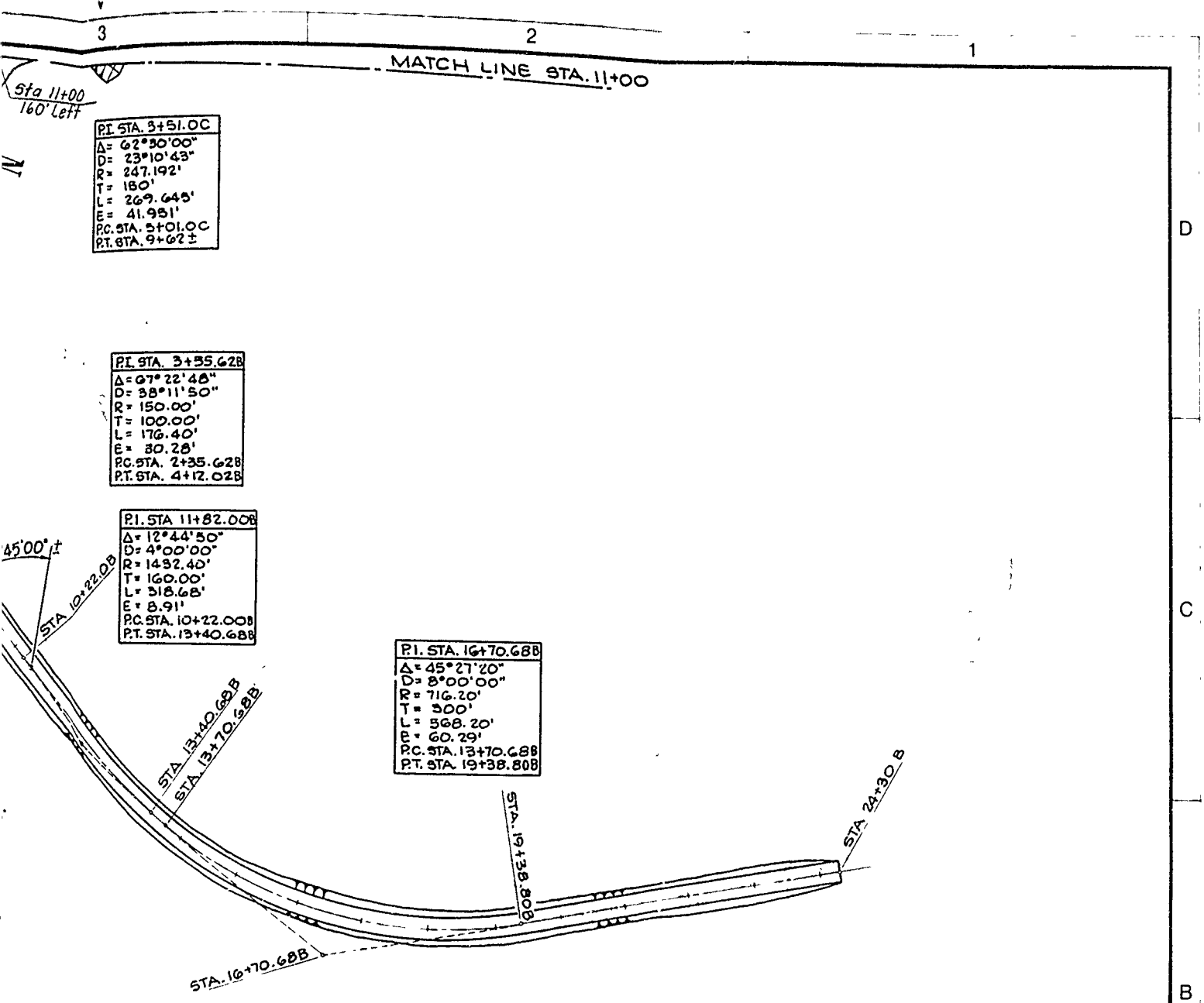
BORING LOGS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

Scale: As shown
Date
Drawing Code:
Sheet reference number
Sheet _ of _

PLATE 7


5
4
3
D
C
B
A
Sta. 12+21.59 C =
Mon 323 El 553.53
End of Levee - El 552.8
Sta 11+00
160' Left
P.I. STA. 3+51.0C
Δ = 62°30'00"
D = 23°10'43"
R = 247.192'
T = 160'
L = 269.645'
E = 41.931'
P.C. STA. 3+01.0C
P.T. STA. 9+62 ±
Sta 3+51C
100' Right
100
P.I. STA. 3+35.62
Δ = 97°22'48"
D = 38°11'50"
R = 150.00'
T = 100.00'
L = 176.40'
E = 30.28'
P.C. STA. 2+35.62
P.T. STA. 4+12.02
P.I. STA. 1+50.00 B
Δ = 90°00'00"
D = 38°11'50"
R = 150.00'
T = 150.00'
L = 235.62'
E = 62.13'
P.C. STA. 0+00.00B
P.T. STA. 2+35.62B
STA 0+00 B
STA. 4+12.02B
STA. 2+35.62B
Sta. 6+88C
270' Left
GOVERNMENT LINE PROPERTY
48°45'00" Lt
STA 10+22.0B
P.I. STA. 11+82.
Δ = 12°44'50"
D = 4°00'00"
R = 1432.40'
T = 160.00'
L = 318.68'
E = 8.91'
P.C. STA. 10+22.0
P.T. STA. 13+40.
STA. 13+40.68
STA. 13+70
STA



0 100 200 300
SCALE

Revisions			
Symbol	Descriptions	Date	Approved

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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

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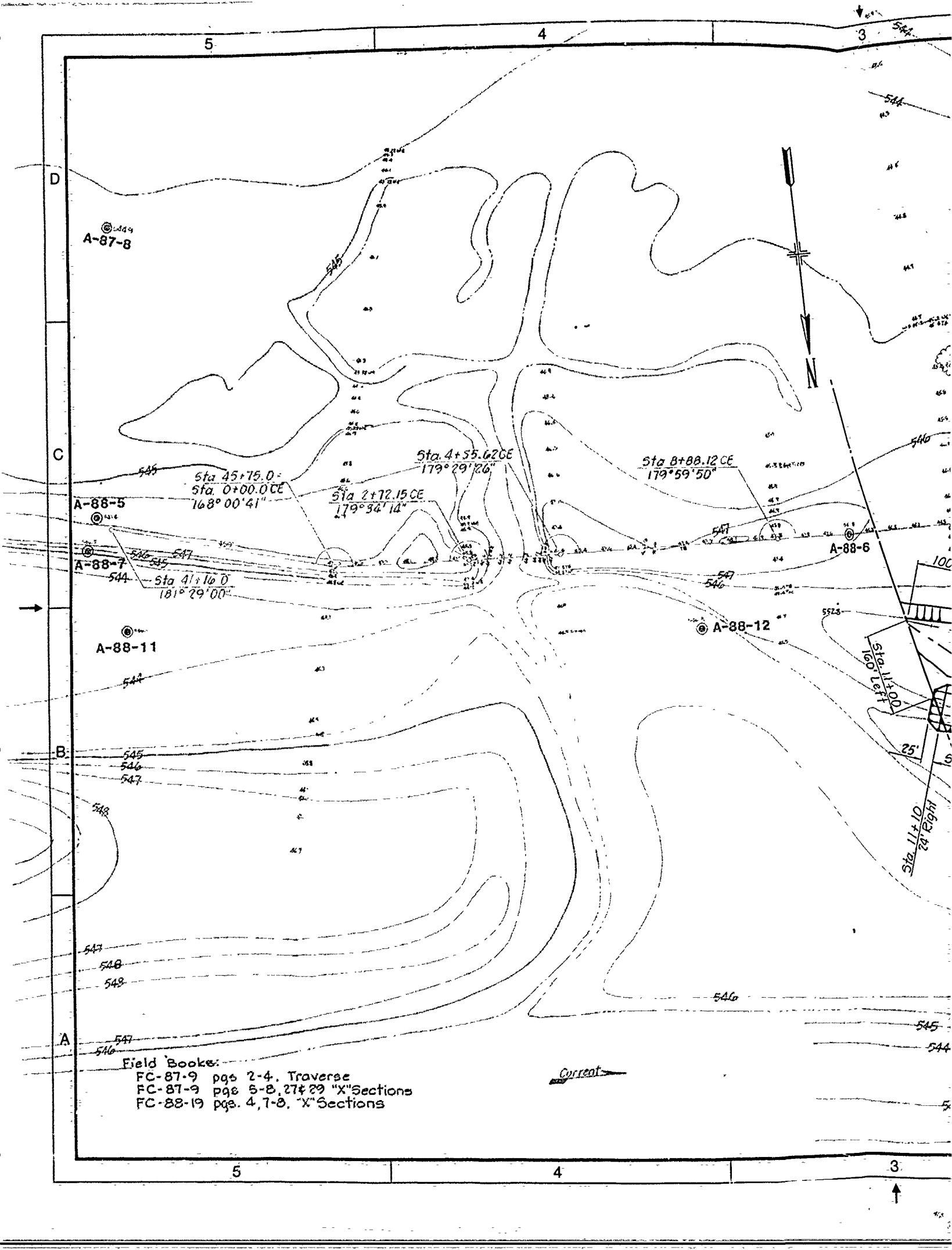
US Army Corps of Engineers

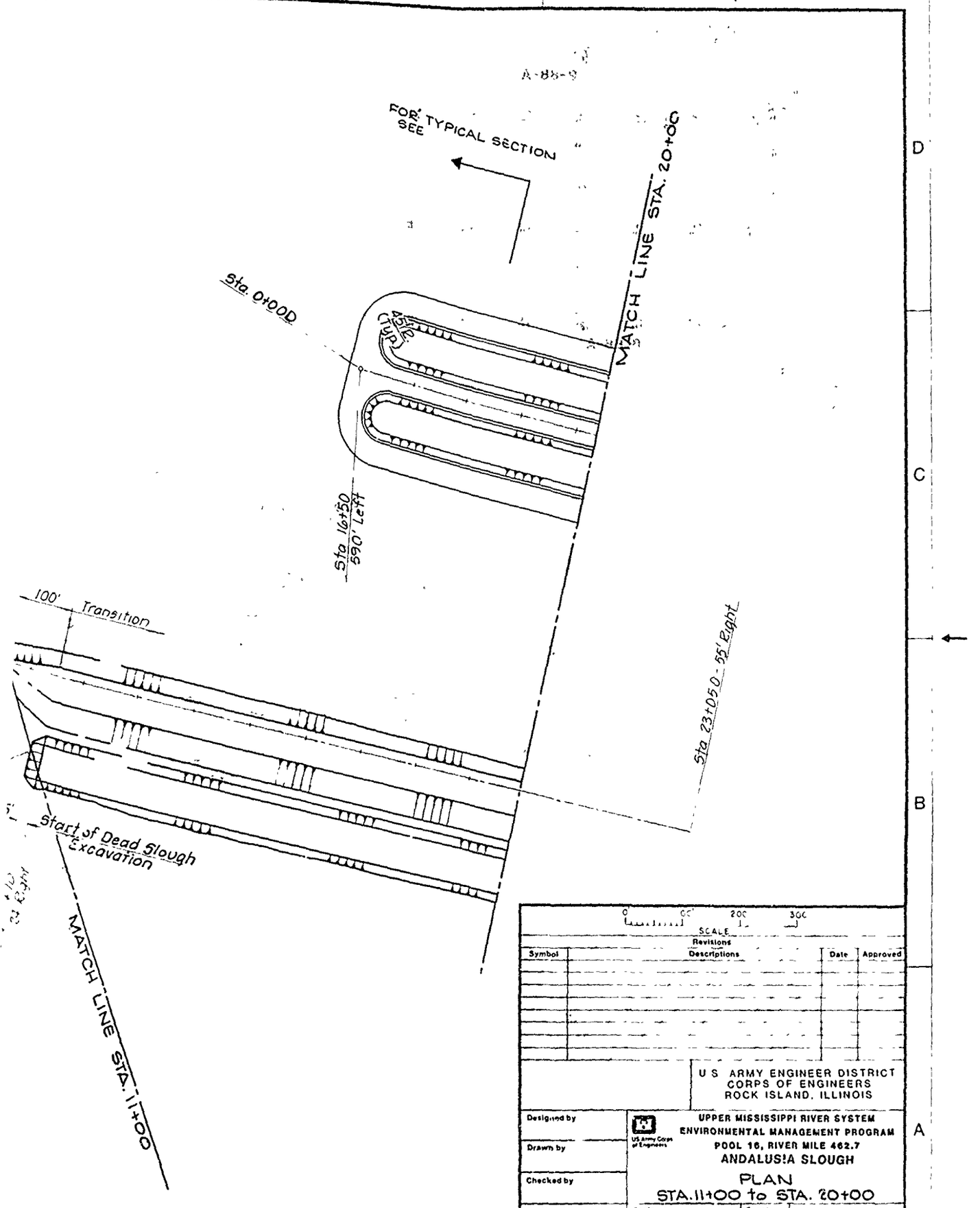
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

PLAN
STA. 12+21.59C to STA. 11+00

Scale As shown
Date
Drawing Code
Sheet reference number
Sheet _ _ of _

PLATE 8


5
4
3
D
C
B
A
A-87-8
A-88-5
A-88-7
A-88-11
A-88-6
A-88-12
Sta 45+75.0 =
Sta. 0+00.0 CE
168° 00' 41"
Sta 2+72.15 CE
179° 34' 14"
Sta. 4+55.62 CE
179° 29' 26"
Sta 8+88.12 CE
179° 59' 50"
Sta 41+16.0
181° 29' 00"
Sta. 11+00
160' Left
Sta. 11+10
24' Right
N
Current
Field Books:
FC-87-9 pgs 2-4, Traverse
FC-87-9 pgs 5-8, 27 & 29 "X" Sections
FC-88-19 pgs. 4, 7-8, "X" Sections



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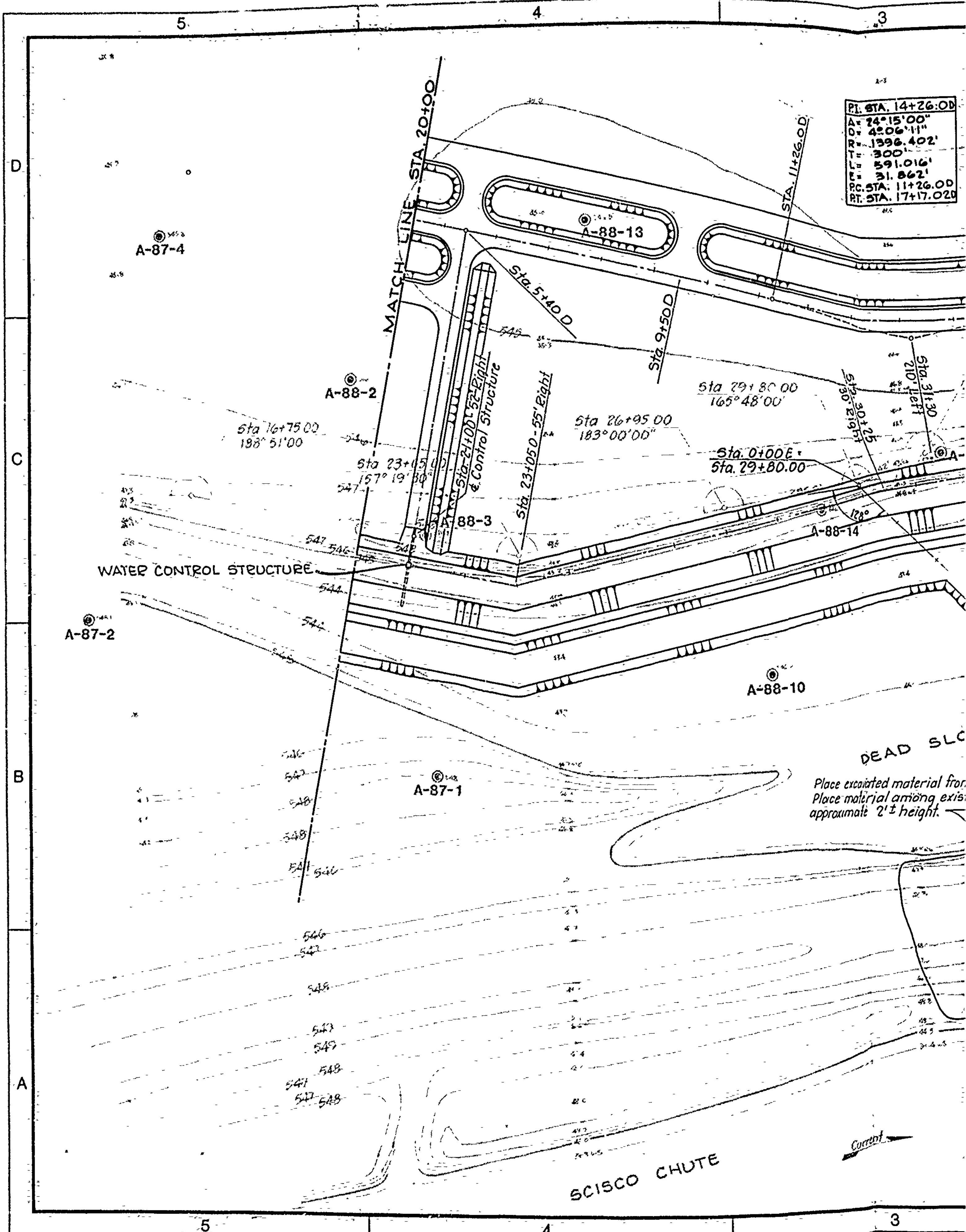
Symbol	Descriptions	Date	Approved

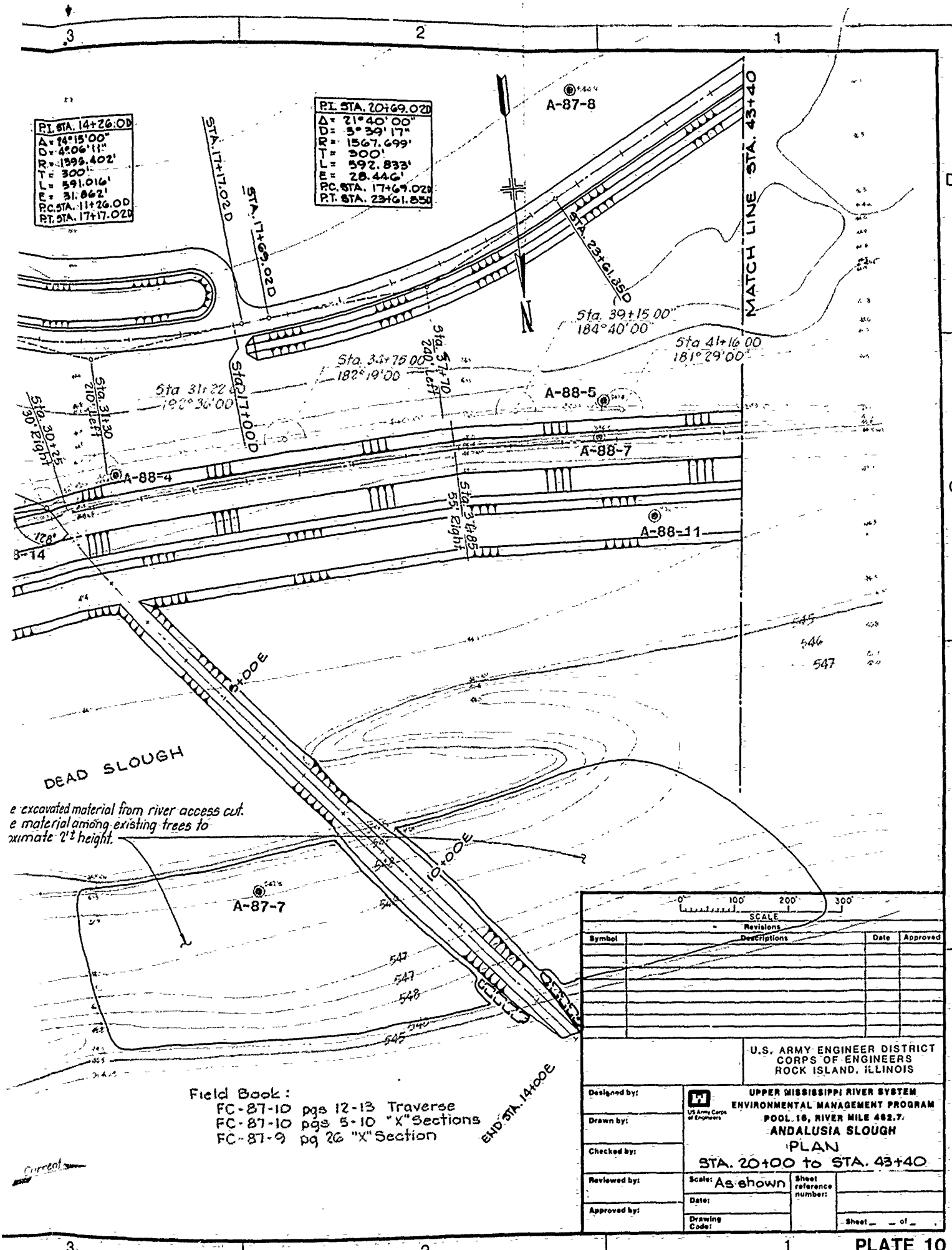
U S ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by	UPPER MISSISSIPPI RIVER SYSTEM
Drawn by	ENVIRONMENTAL MANAGEMENT PROGRAM
Checked by	POOL 16, RIVER MILE 462.7
Reviewed by	ANDALUSIA SLOUGH
Approved by:	PLAN STA. 11+00 to STA. 20+00
Scale: As shown	Sheet reference number
Date:	
Drawing Code	Sheet _ _ of _

PLATE 9



MATCH LINE STA. 20+00
P.I. STA. 14+26.OD
Δ= 24°15'00"
D= 4°06'11"
R= 1396.402'
T= 300'
L= 591.016'
E= 31.862'
P.C. STA. 11+26.00
P.T. STA. 17+17.020
A-87-4
A-88-13
A-88-2
A-88-3
A-88-14
A-88-10
A-87-2
A-87-1
Sta. 5+40 D
Sta. 9+50 D
STA. 11+26.0D
Sta 16+75.00
198° 51'00
Sta 23+05.00
157° 19' 30"
Sta. 21+00 52' Right
℄ Control Structure
Sta. 23+05.0 - 55' Right
Sta 26+95.00
183°00'00"
Sta 29+80.00
165°48'00'
Sta. 0+00 E =
Sta. 29+80.00
Sta. 30+25
30' Right
Sta. 31+30
210' Left
128°
WATER CONTROL STRUCTURE
DEAD SLO
Place excavated material from
Place material among exis
approximate 2'± height.
Control
SCISCO CHUTE
5
4
3
D
C
B
A


P.I. STA. 14+26.00
Δ = 14°15'00"
D = 4°06'11"
R = 1396.402'
T = 300'
L = 591.016'
E = 31.862'
P.C. STA. 11+26.00
P.T. STA. 17+17.02D
P.I. STA. 20+69.02D
Δ = 21°40'00"
D = 3°39'17"
R = 1567.699'
T = 300'
L = 592.833'
E = 28.446'
P.C. STA. 17+69.02D
P.T. STA. 23+61.85D
STA. 17+17.02D
STA. 17+69.02D
STA. 23+61.85D
MATCH LINE STA. 43+40
A-87-8
A-88-5
A-88-7
A-88-11
A-88-4
A-87-7
Sta. 39+15.00
184°40'00
Sta. 41+16.00
181°29'00
Sta. 34+75.00
182°19'00
Sta. 31+22.4
190°36'00
Sta. 17+00D
Sta. 31+30
210' Left
Sta. 30+25
30' Right
Sta. 37+70
240' Left
Sta. 37+85
55' Right
10+00E
8+00E
DEAD SLOUGH
e excavated material from river access cut.
e material among existing trees to
ximate 2' height.
Field Book:
FC-87-10 pgs 12-13 Traverse
FC-87-10 pgs 5-10 "X" Sections
FC-87-9 pg 26 "X" Section
END STA. 14+00E
Current
SCALE
0' 100' 200' 300'
Revisions
Symbol | Descriptions | Date | Approved
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS
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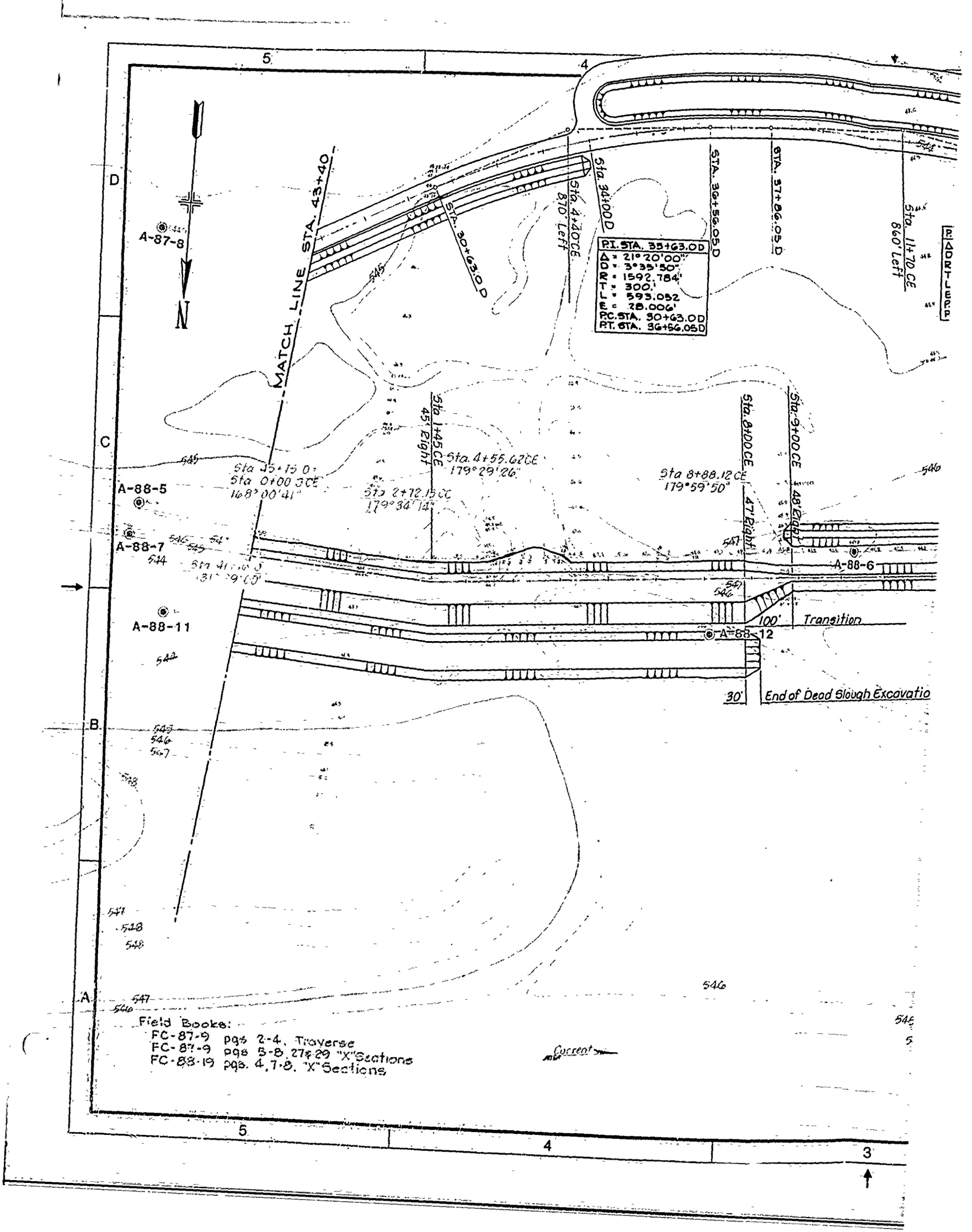
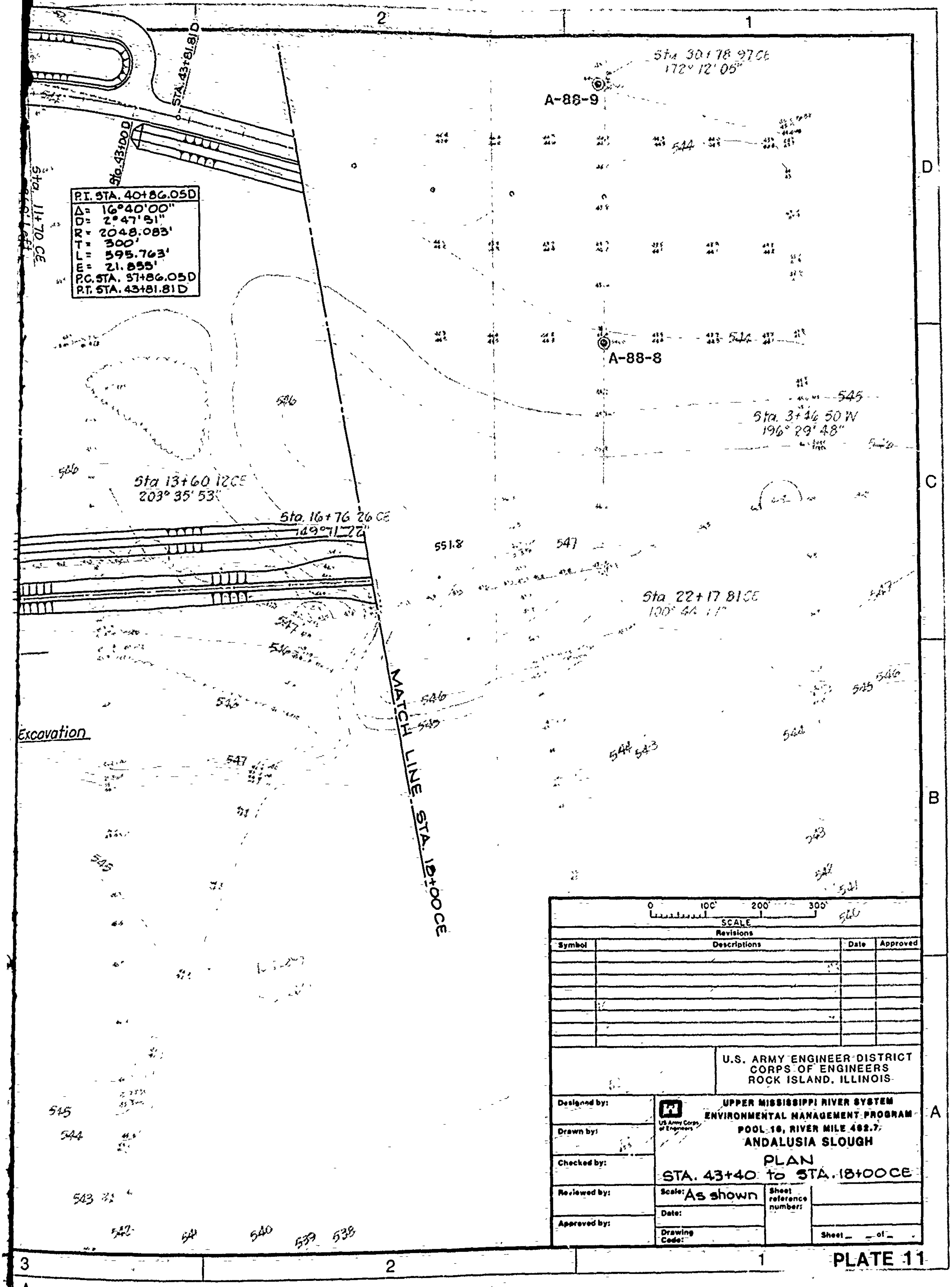
US Army Corps of Engineers
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 482.7
ANDALUSIA SLOUGH
PLAN
STA. 20+00 to STA. 43+40
Scale: As shown
Date:
Drawing Code:
Sheet reference number:
Sheet _ of _

PLATE 10


MATCH LINE STA. 43+40
Sta 34+00 D
STA. 30+63.0 D
Sta. 4+30 CE
870' Left
STA. 36+56.05 D
STA. 37+86.05 D
Sta. 11+70 CE
860' Left
P.I. STA. 35+63.00
Δ = 21°20'00"
D = 3°35'50"
R = 1592.784'
T = 300'
L = 593.052
E = 28.006'
P.C. STA. 30+63.00
P.T. STA. 36+56.05 D
Sta. 1+45 CE
45' Right
Sta. 4+55.62 CE
179°29'26"
Sta 8+88.12 CE
179°59'50"
Sta. 8+00 CE
47' Right
Sta. 9+00 CE
48' Right
Sta 0+00 3 CE
168°00'41"
Sta 2+72.15 CE
179°34'14"
100' Transition
30'
End of Dead Slough Excavatio
A-87-8
A-88-5
A-88-7
A-88-11
A-88-6
A-88-12
Field Books:
FC-87-9 pgs 2-4, Traverse
FC-87-9 pgs 5-8, 27 & 29 "X" Sections
FC-88-19 pgs. 4, 7-8, "X" Sections
Current



P.I. STA. 40+86.05D
Δ= 16°40'00"
D= 2°47'51"
R= 2048.083'
T= 300'
L= 595.763'
E= 21.855'
P.C. STA. 37+86.05D
P.T. STA. 43+81.81D
STA. 43+81.81D
Sta. 43+00D
Sta. 11+70 CE
Sta 30+78.97CE
172° 12' 05"
A-88-9
A-88-8
Sta. 3+46.50 W
196° 29' 48"
Sta 13+60.12CE
203° 35' 53"
Sta. 16+76.26 CE
Sta. 22+17.81CE
MATCH LINE STA. 18+00CE
Excavation
551.8
SCALE
U.S. ARMY ENGINEER DISTRICT
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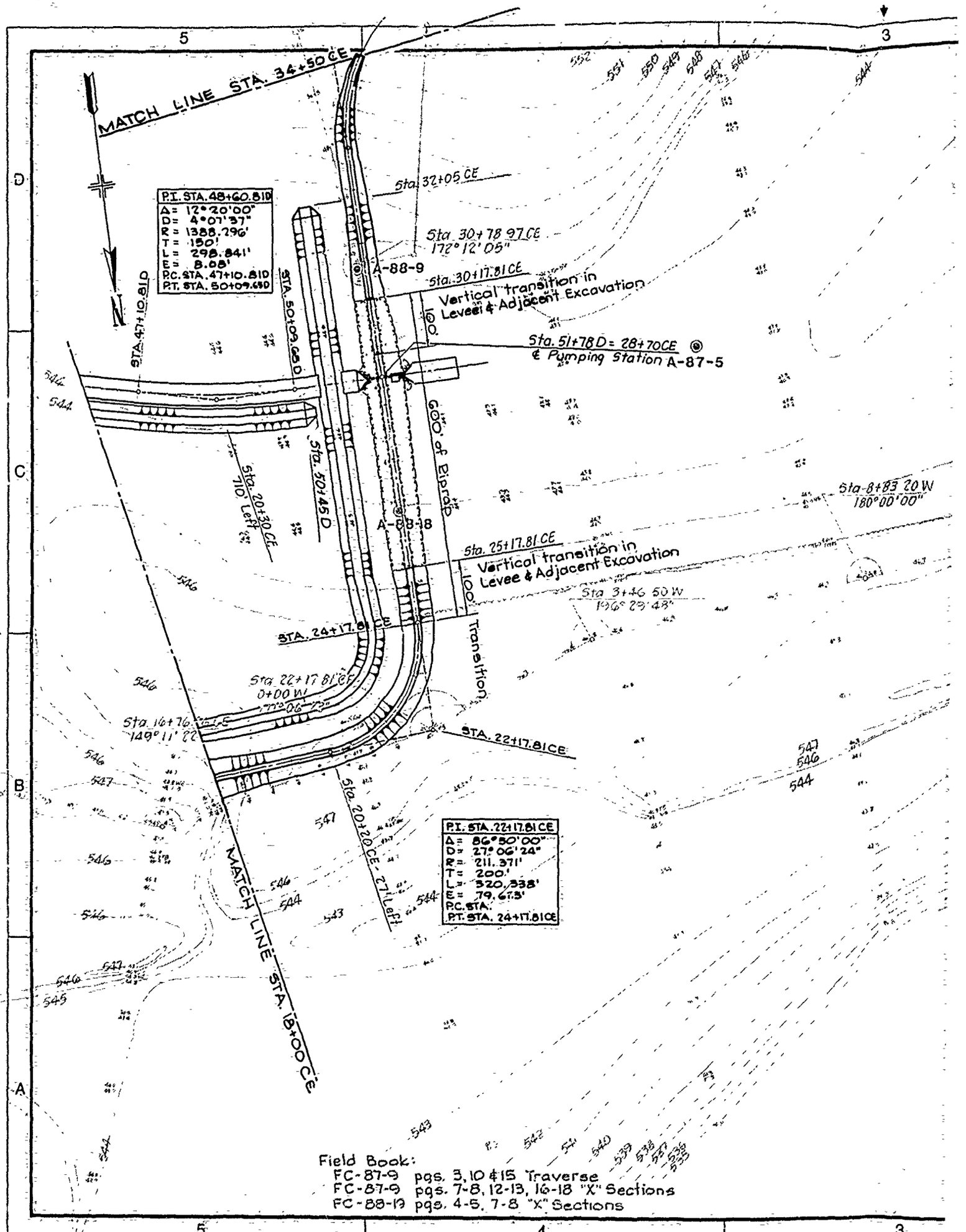
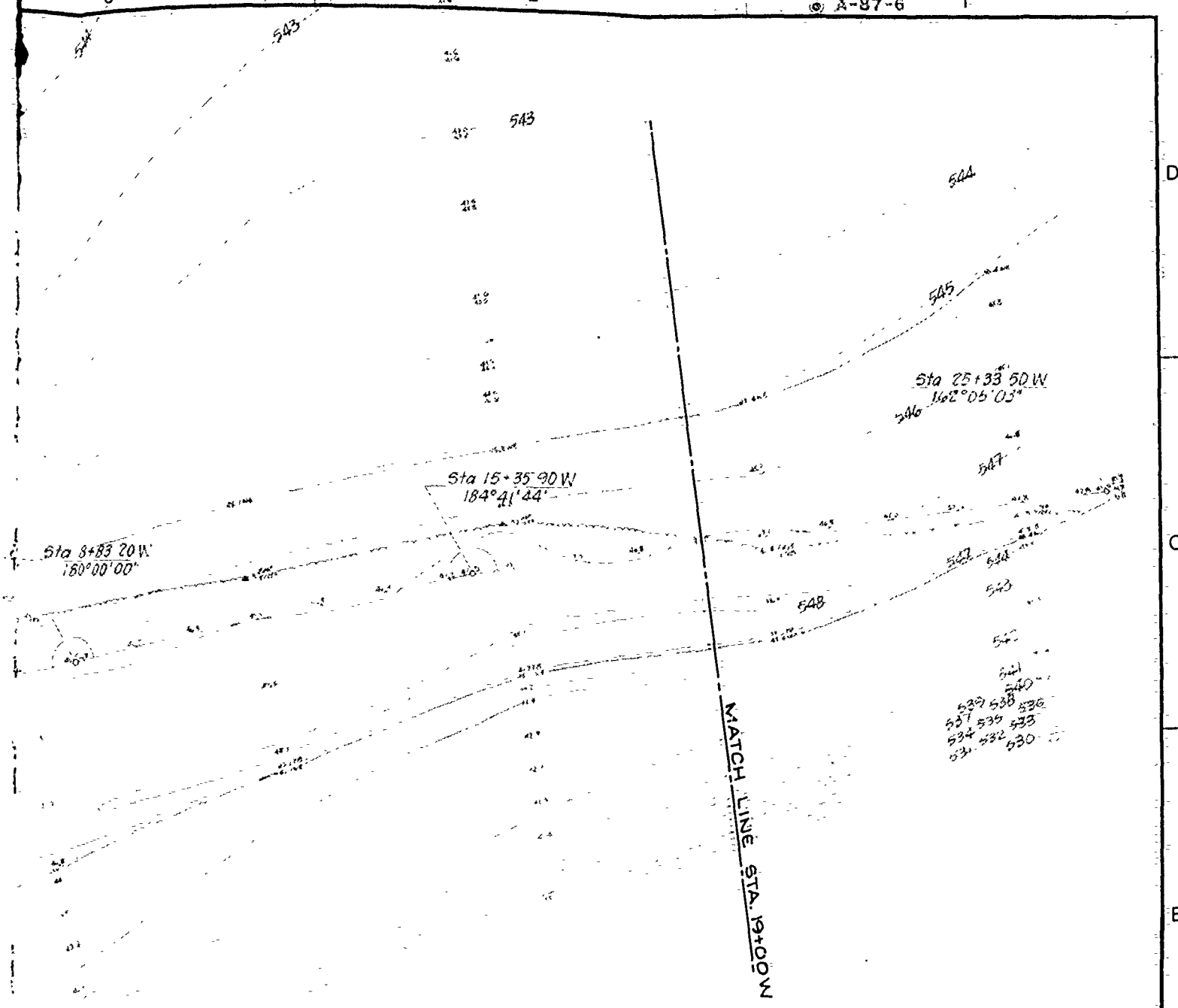
ROCK ISLAND, ILLINOIS
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH
PLAN
STA. 43+40 to STA. 18+00CE
Scale: As shown
PLATE 11



Field Book:
FC-87-9 pgs. 3, 10 & 15 Traverse
FC-87-9 pgs. 7-8, 12-13, 16-18 "X" Sections
FC-88-19 pgs. 4-5, 7-8 "X" Sections



SCALE: 1" = 100.0'
0 100 200 300

Revisions

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

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US Army Corps of Engineers

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 482.7
ANDALUSIA SLOUGH
PLAN
STA. 18+00 CE to STA. 19+00 W
& to STA. 34+50 CE

Scale: As shown
Date:
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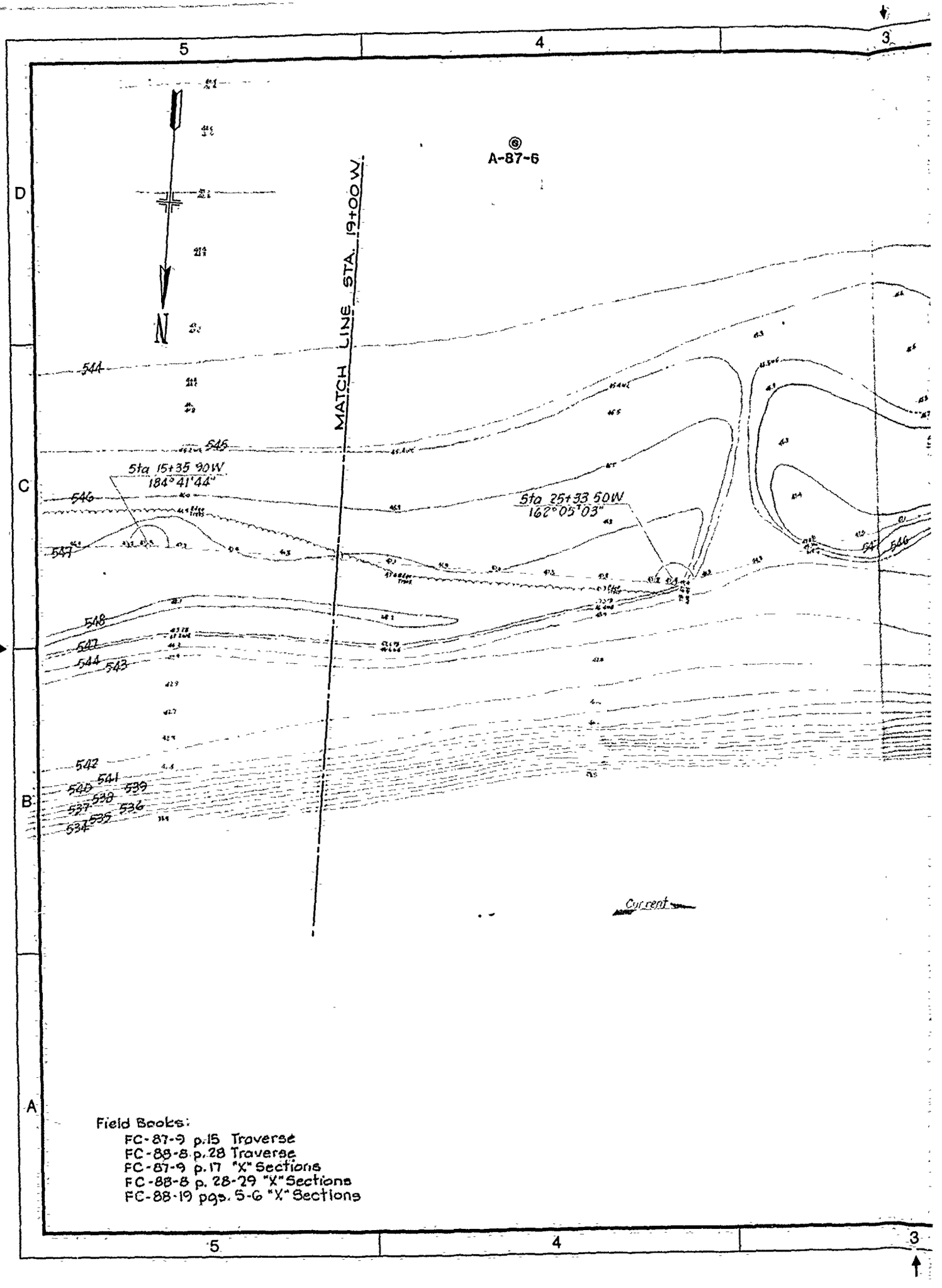
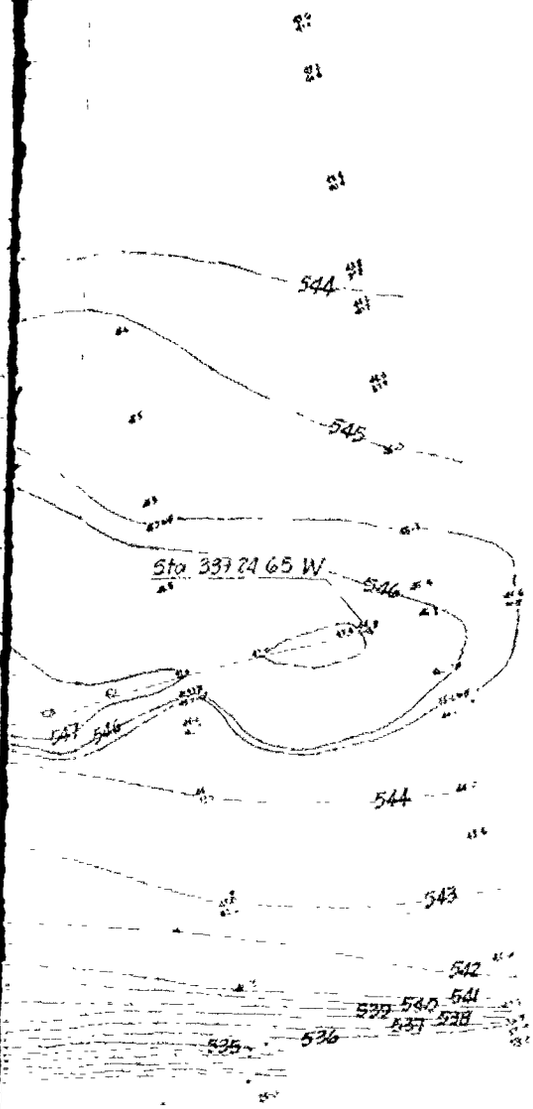


Field Books:

FC-87-9 p.15 Traverse
FC-88-8 p.28 Traverse
FC-87-9 p.17 "X" Sections
FC-88-8 p. 28-29 "X" Sections
FC-88-19 pgs. 5-6 "X" Sections



This Plate was provided to show area of not recommended bank protection. (Alternative F).
Monitoring ranges have been established in this area as shown on Plate 23.

0 100' 200' 300'
SCALE

Revisions

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U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

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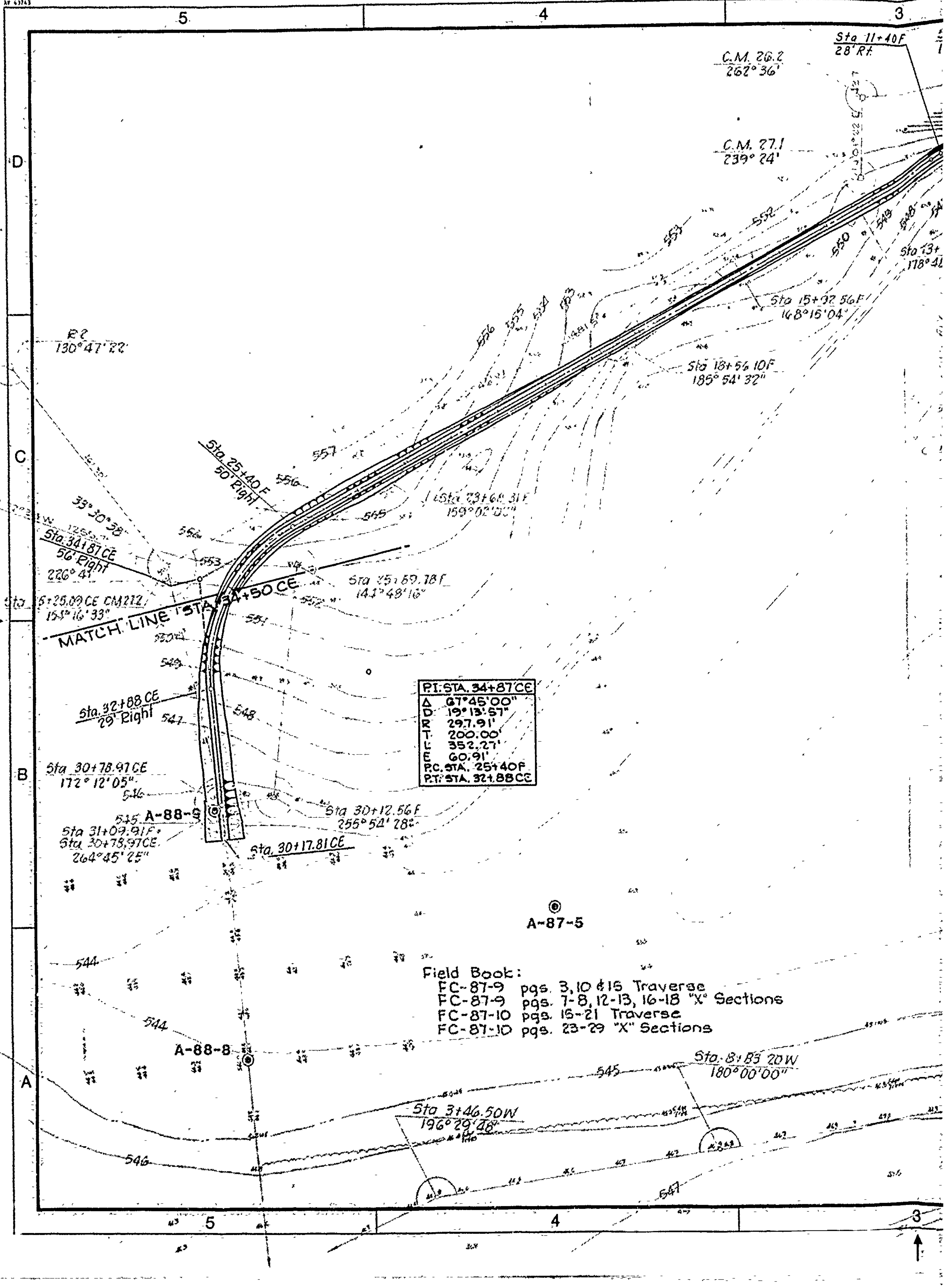
Reviewed by:
Approved by:
NEIL A. SMART
COL., CORPS OF ENGINEERS

US Army Corps of Engineers

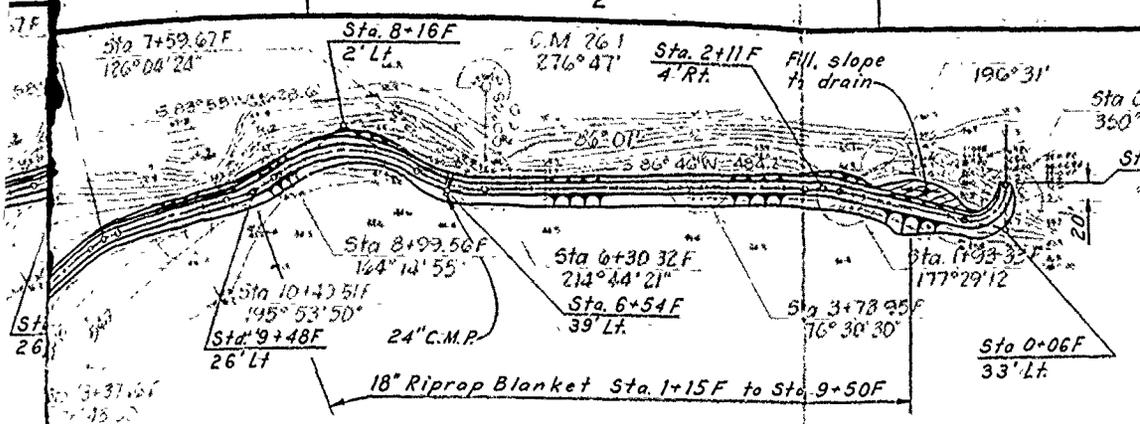
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH
PLAN
STA. 19+00W to STA. 33+24.65W

Scale: As shown
Date:
Drawing Code:
Sheet reference number:
Sheet _ of _

PLATE 13



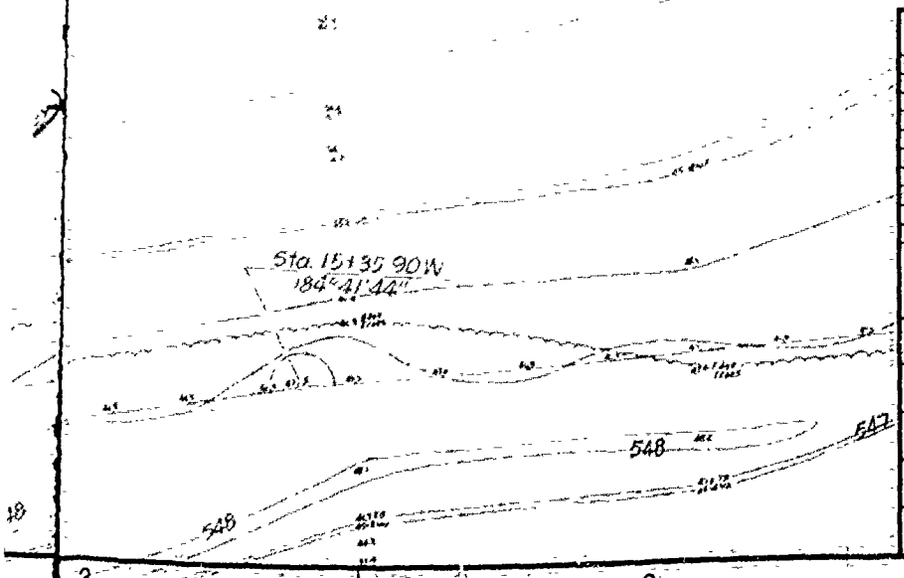
Sta 11+40F
28' Rt.
C.M. 26.2
262° 36'
C.M. 27.1
239° 24'
Sta 15+92.56F
168°15'04"
Sta 18+56.10F
185° 54' 32"
130°47'22"
Sta. 25+40 F
50' Right
Sta 23+68.31F
159°02'00"
33°30'38"
Sta. 34+87 CE
56' Right
226° 41'
Sta 25+89.78F
141°48'16"
Sta 16+25.09 CE CM 27.2
MATCH LINE STA. 34+50 CE
P.I. STA. 34+87 CE
Δ 67°45'00"
D 19°13'57"
R 297.91'
T 200.00'
L 352.27'
E 60.91'
P.C. STA. 25+40F
P.T. STA. 32+88 CE
Sta. 32+88 CE
29' Right
Sta 30+78.97 CE
172° 12' 05"
A-88-9
Sta 30+12.56F
255° 54' 28"
Sta 31+09.91F
Sta 30+78.97CE
264°45'25"
Sta. 30+17.81 CE
A-87-5
Field Book:
FC-87-9 pgs. 3, 10 & 15 Traverse
FC-87-9 pgs. 7-8, 12-13, 16-18 "X" Sections
FC-87-10 pgs. 15-21 Traverse
FC-87-10 pgs. 23-29 "X" Sections
A-88-8
Sta. 8+83.20W
180°00'00"
Sta 3+46.50W
196°29'48"
544
545
546
547
548
549
550
551
552
553
554
555
556
557
5
4
3
A
B
C
D



CURVE DATA

P.I. STA.	0+06F	2+11F	6+54F	8+16F	9+48F	11+40F
Δ	101°30'	15°	31°30'	65°30'	24°	16°
R	40'	150'	150'	150'	150'	150'
T	49.0'	19.7'	42.3'	96.5'	31.9'	21.1'
L	70.9'	39.3'	82.5'	171.5'	62.8'	41.9'
E	23.2'	1.3'	5.8'	28.4'	3.2'	1.5'
P.C. STA.	0+06F	2+02F	6+30F	6+95F	9+18F	11+19F
P.T. STA.	0+53F	2+41F	6+95F	9+18F	9+78F	11+51F

A-87-6



Revisions			
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CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 482.7.
ANDALUSIA SLOUGH

STA. 34+50CE to STA. 0+00 E

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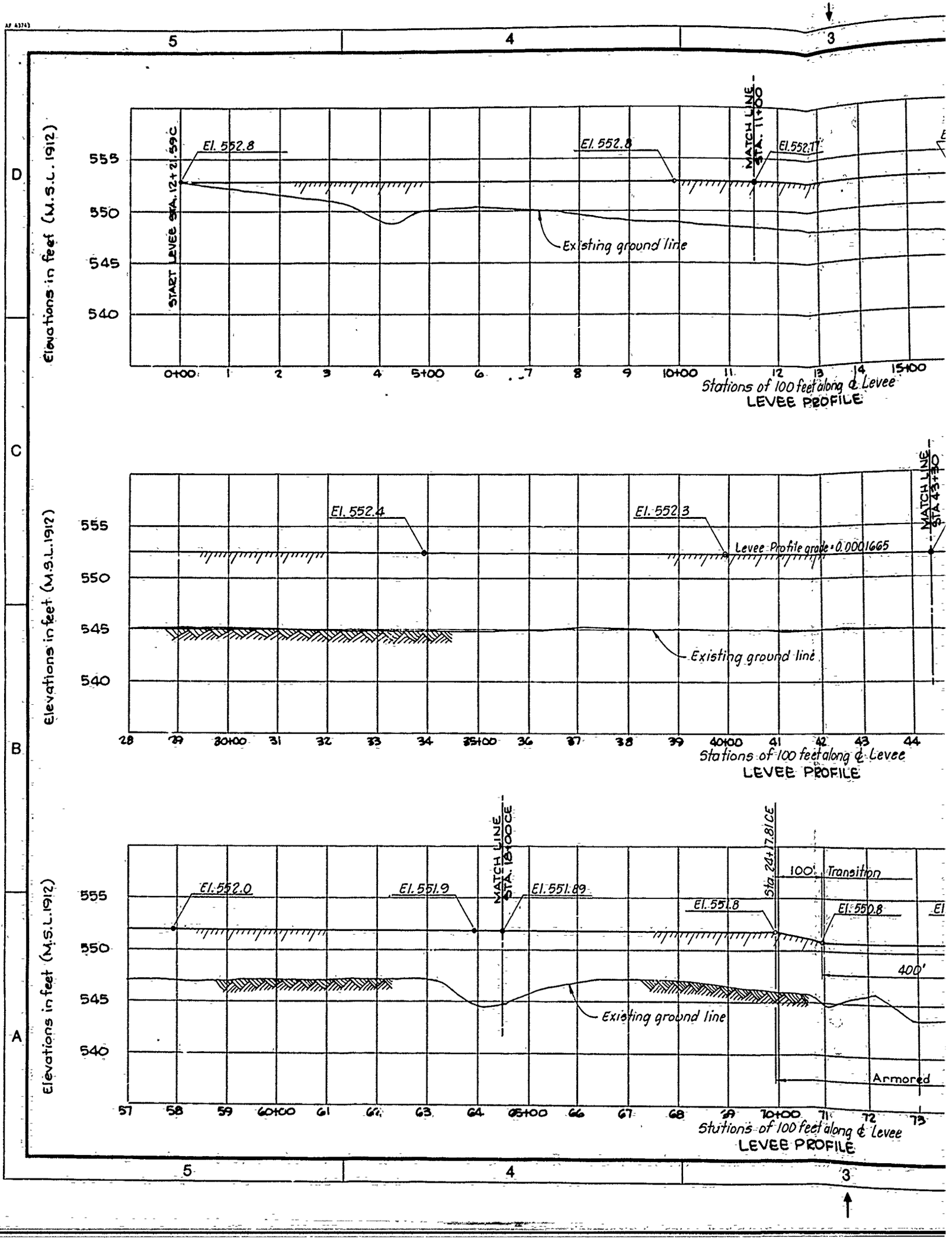
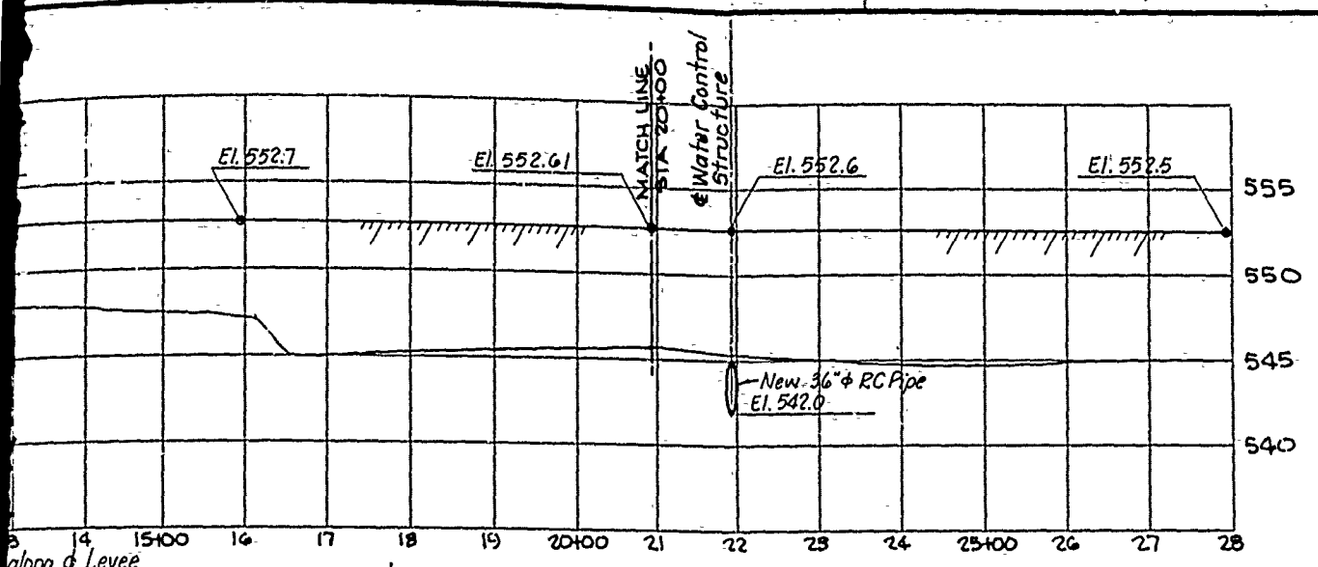
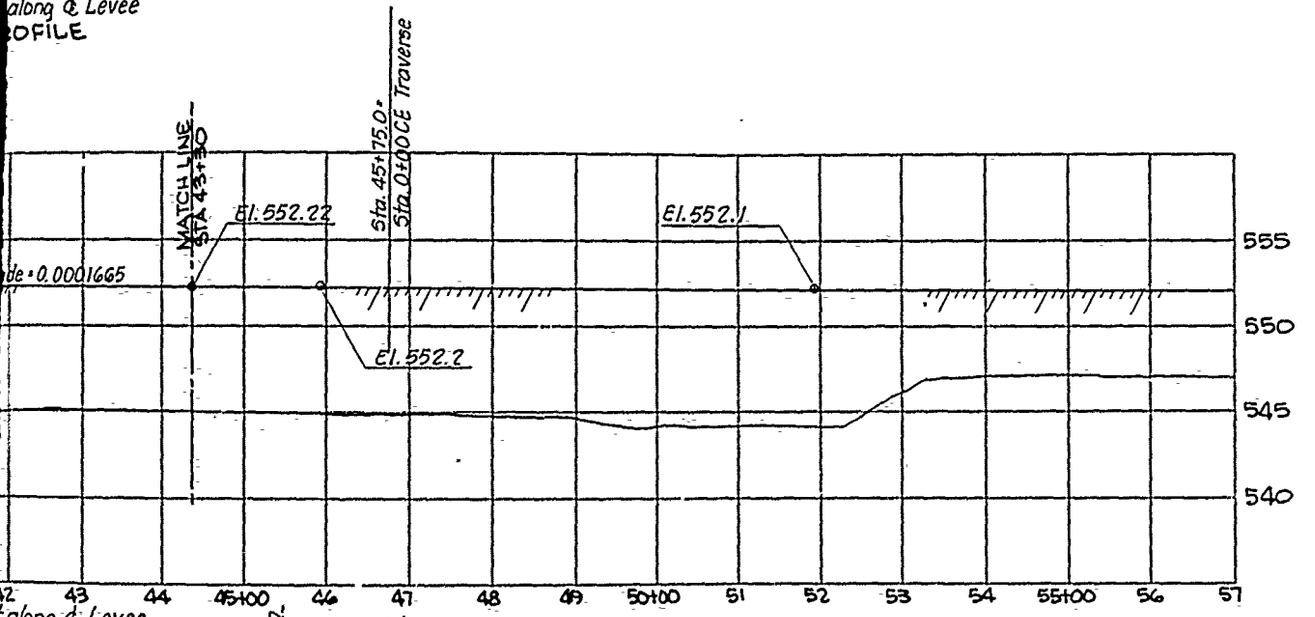
Checked by:		Drawing Code:	Sheet __ of __
Reviewed by:			
Approved by:			

PLATE 14

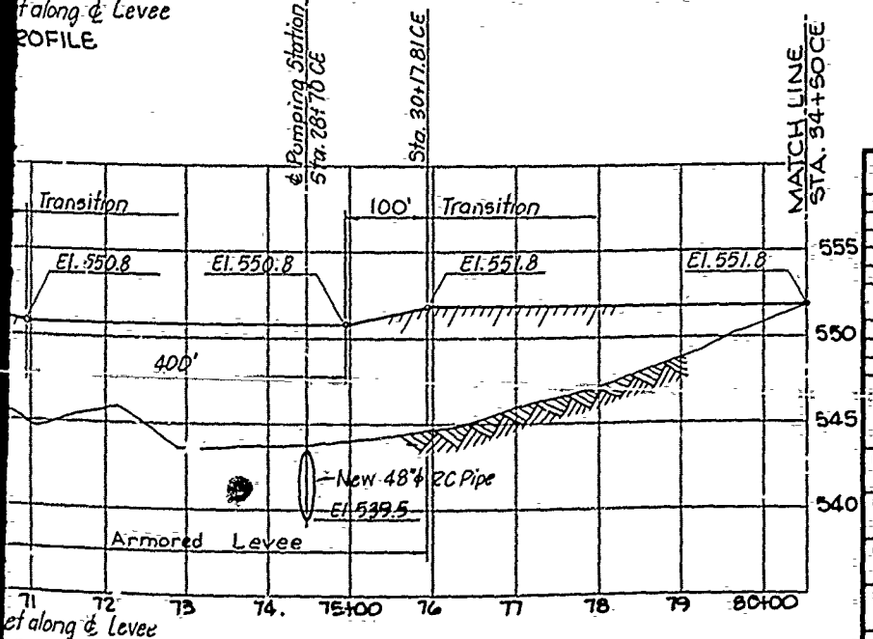

5
4
3
D
C
B
A
Elevations in feet (M.S.L. 1912)
555
550
545
540
START LEVEE STA. 12+21.59C
El. 552.8
El. 552.8
MATCH LINE STA. 11+00
El. 552.77
Existing ground line
0+00
1
2
3
4
5+00
6
7
8
9
10+00
11
12
13
14
15+00
Stations of 100 feet along ℄ Levee
LEVEE PROFILE
El. 552.4
El. 552.3
MATCH LINE STA. 43+30
Levee Profile grade = 0.0001665
Existing ground line
28
29
30+00
31
32
33
34
35+00
36
37
38
39
40+00
41
42
43
44
Stations of 100 feet along ℄ Levee
LEVEE PROFILE
El. 552.0
El. 551.9
MATCH LINE STA. 18+00CE
El. 551.89
Sta. 24+17.81CE
100' Transition
El. 551.8
El. 550.8
400'
Existing ground line
Armored
57
58
59
60+00
61
62
63
64
65+00
66
67
68
69
70+00
71
72
73
Stations of 100 feet along ℄ Levee
LEVEE PROFILE



along ℄ Levee
OFILE



t along ℄ Levee
OFILE



et along ℄ Levee
OFILE

Revisions			
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ROCK ISLAND, ILLINOIS

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7.
ANDALUSIA SLOUGH

PROFILES I

Scale: As shown
Date:
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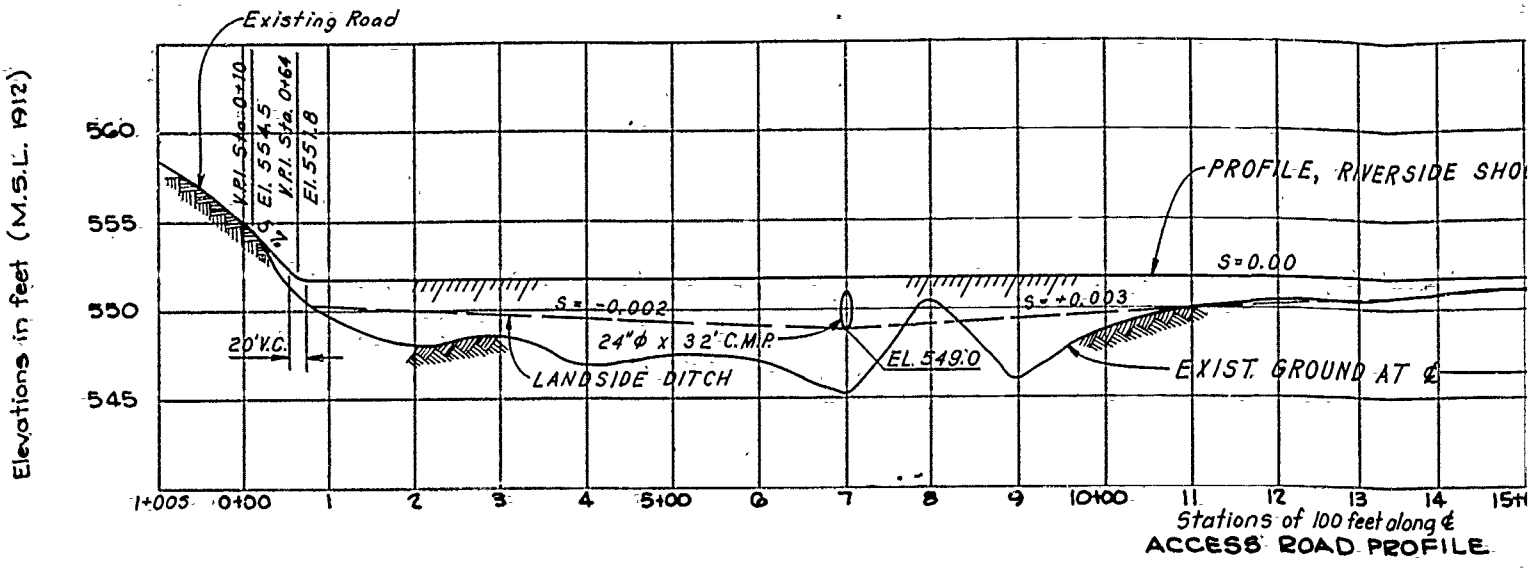
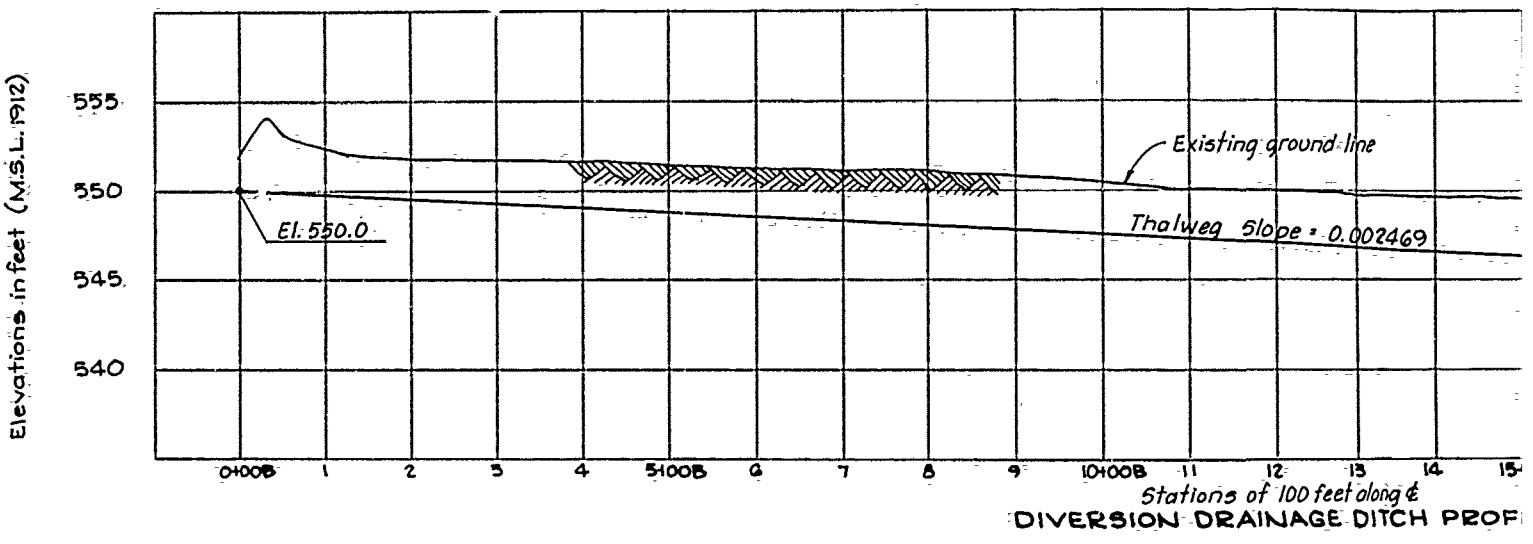
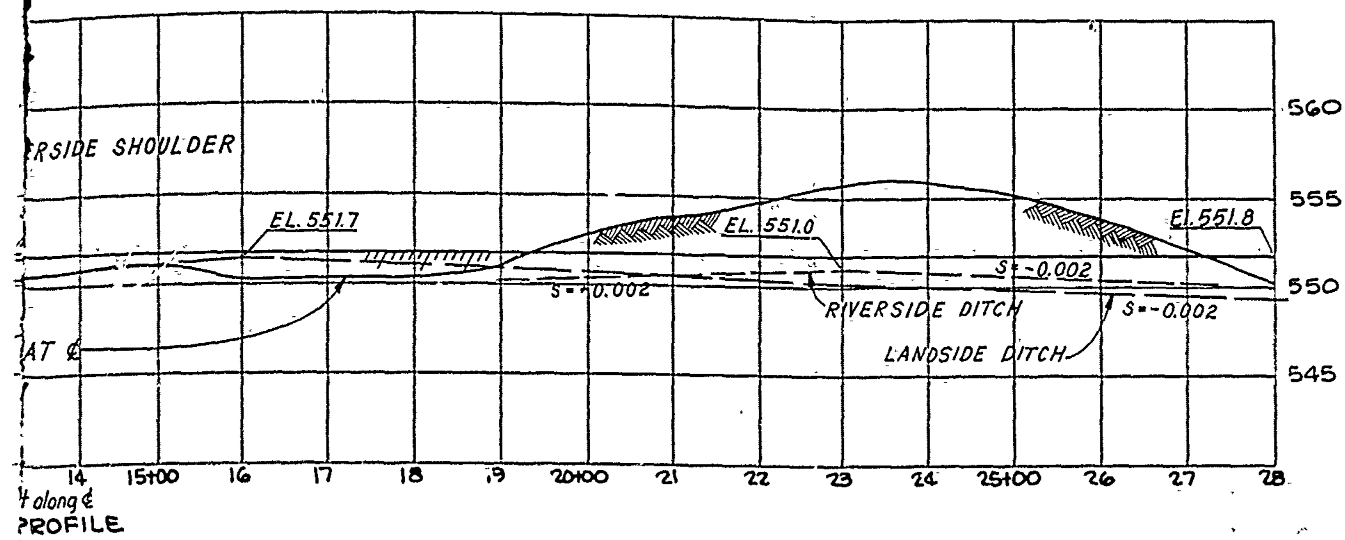
PLATE 15

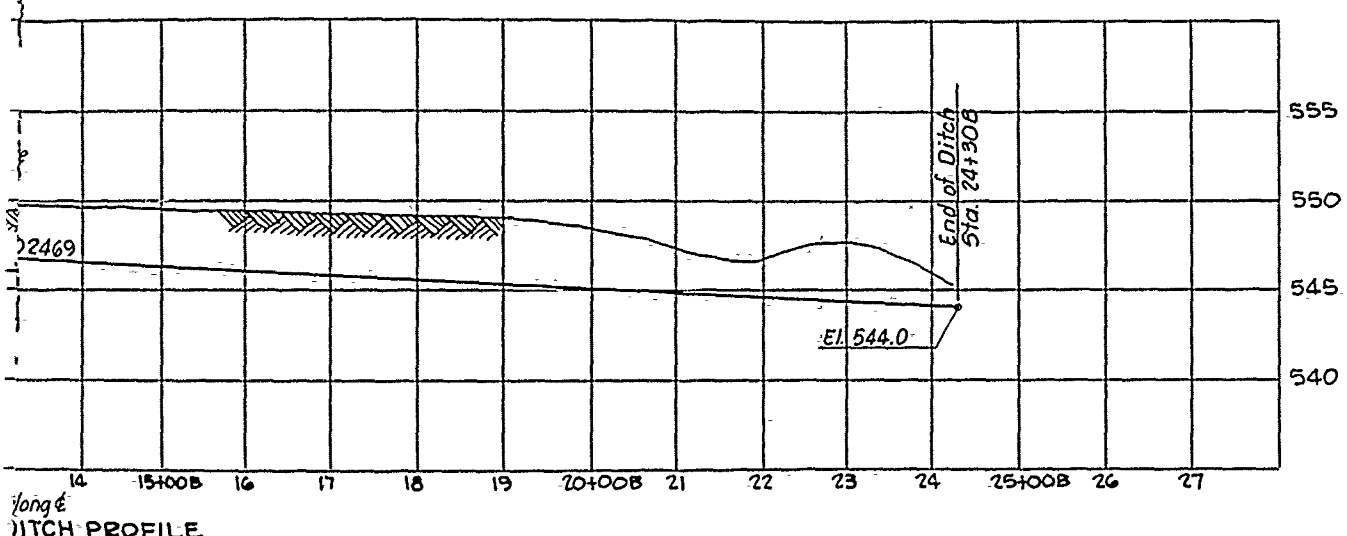


ACCESS ROAD PROFILE



DIVERSION DRAINAGE DITCH PROF





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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

PROFILES II

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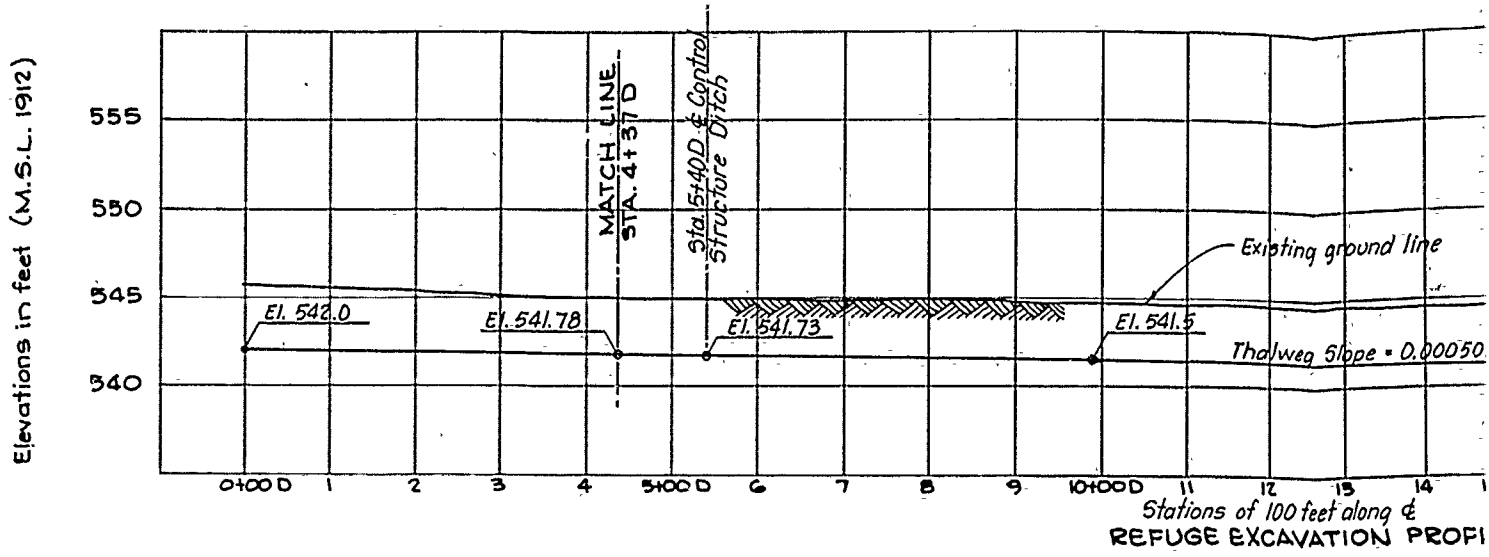
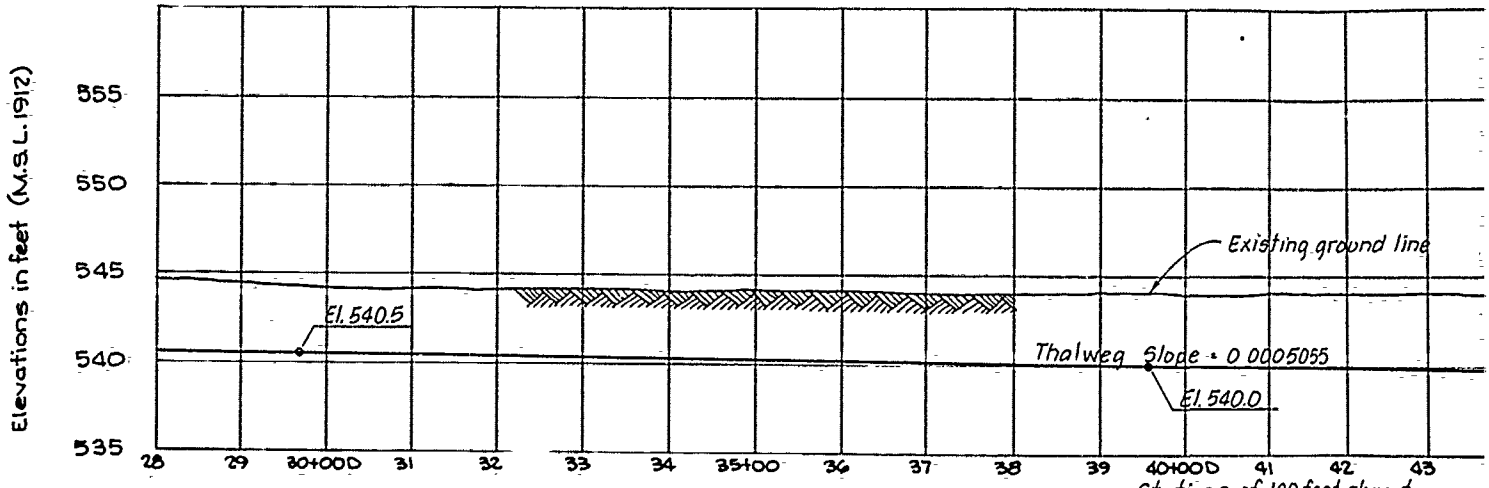
PLATE 16

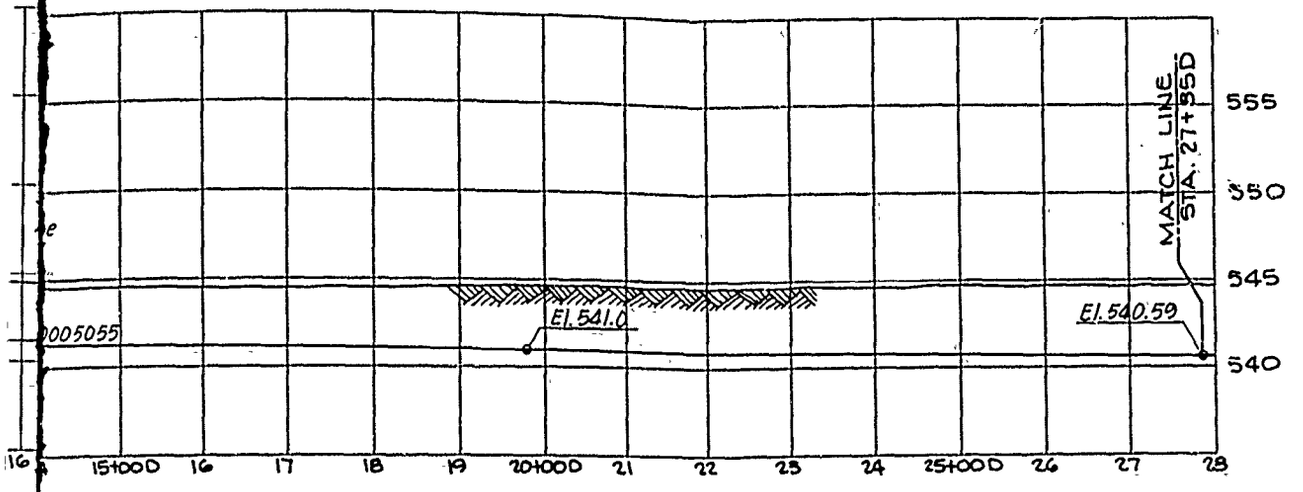
AP 43743



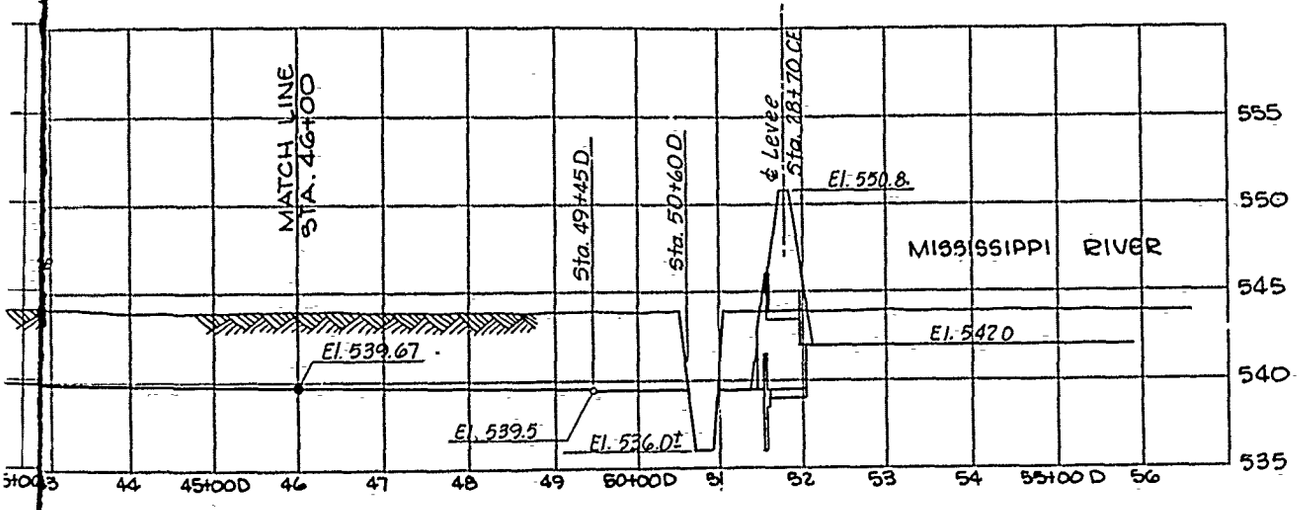
REFUGE EXCAVATION PROFI



REFUGE EXCAVATION PROFILE



ROFILE



OFILE

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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

PROFILES III

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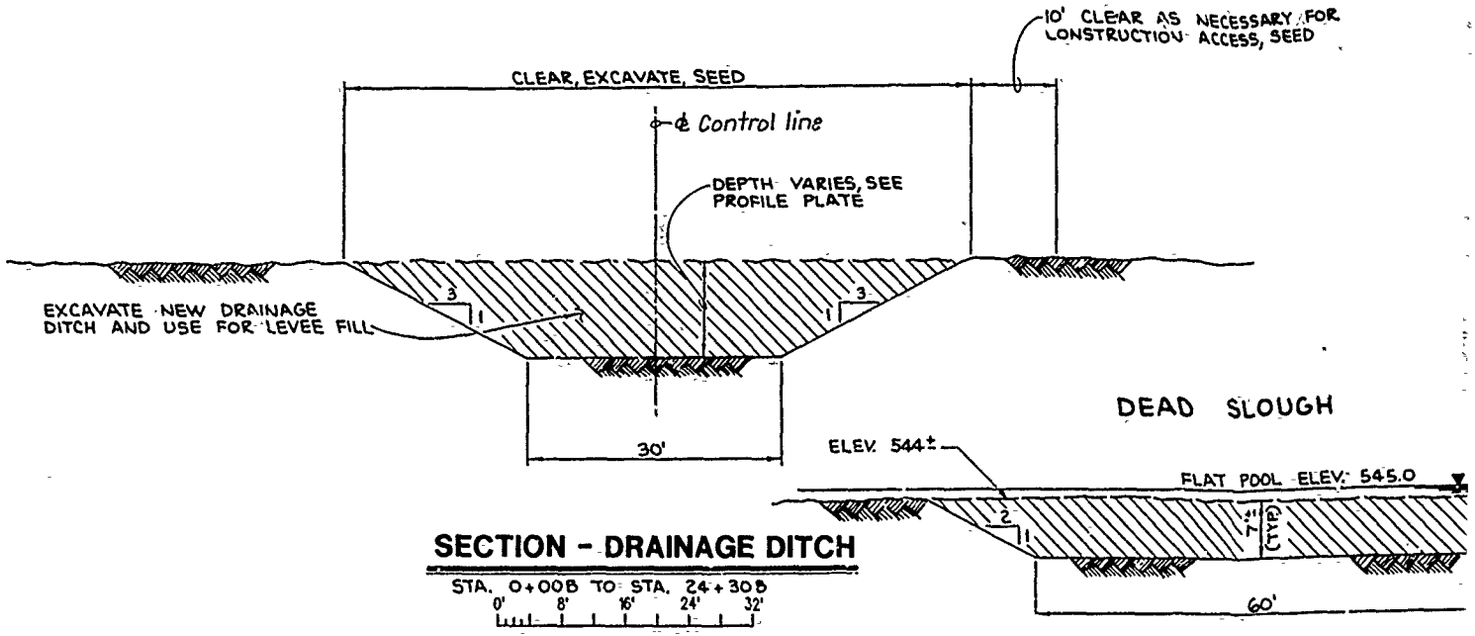
Approved by:			

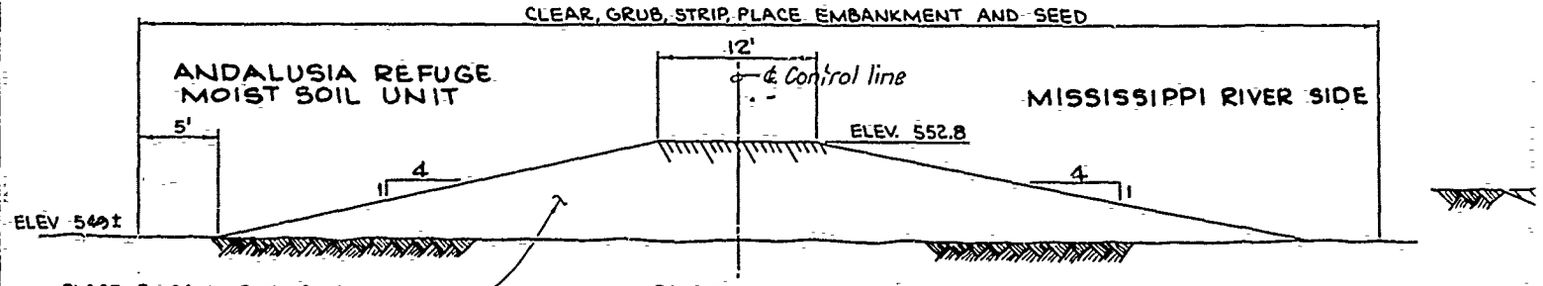
PLATE 17



SECTION - DRAINAGE DITCH

STA. 0+00B TO STA. 24+30B

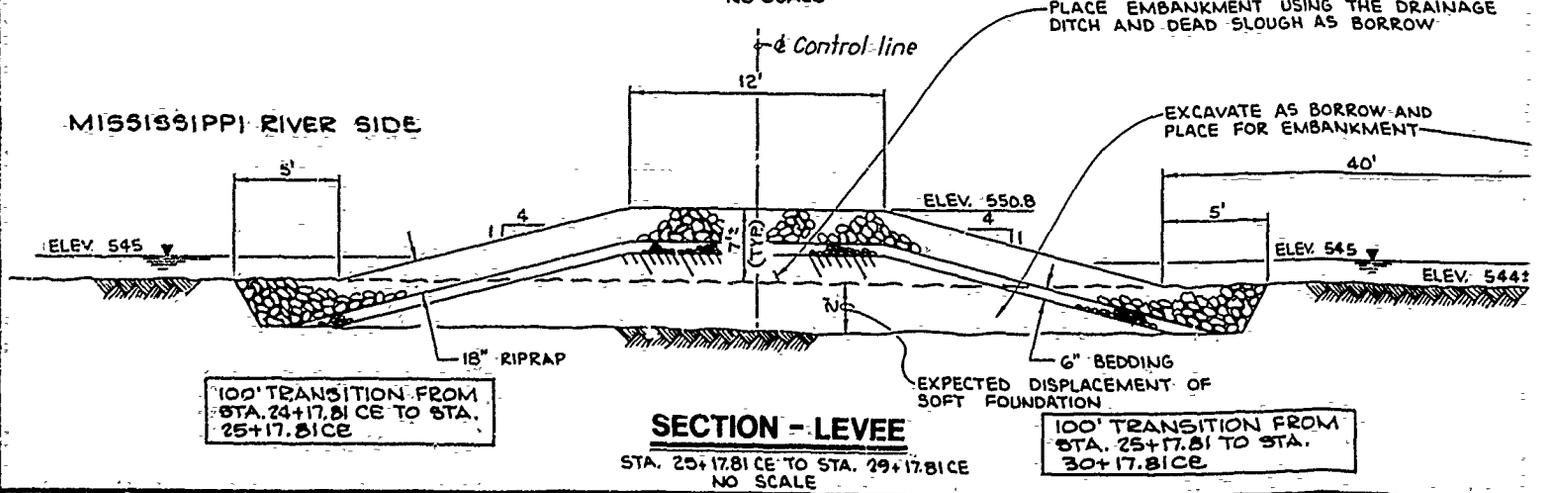
0' 8' 16' 24' 32'



SECTION - LEVEE

STA. 12+21.59C TO STA. 11+00

NO SCALE



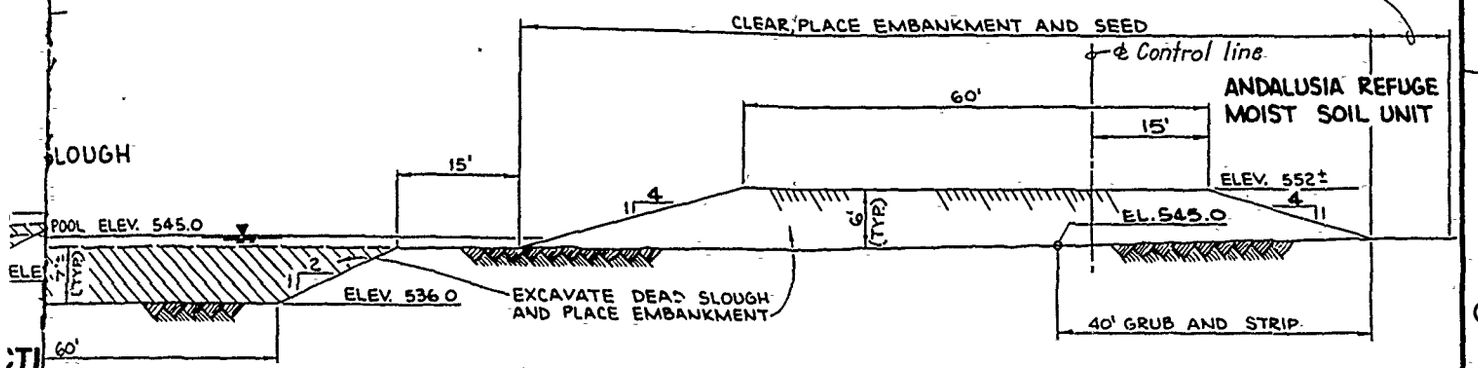
SECTION - LEVEE

STA. 25+17.81 CE TO STA. 29+17.81 CE

NO SCALE

SSARY FOR
SS, SEED

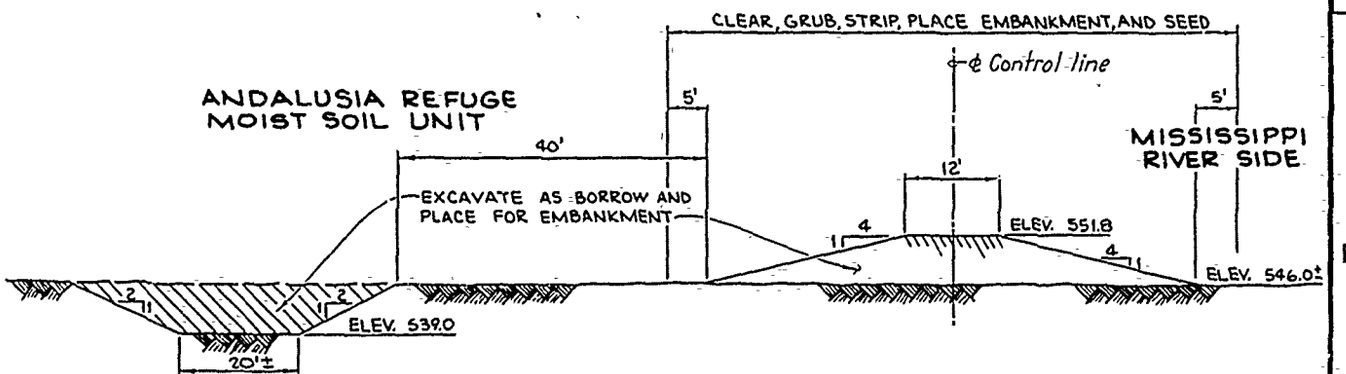
10' CONSTRUCTION ACCESS MAYBE CONSTRUCTED IF DESIRED. CONSTRUCTION ACCESS MUST BE STAKED OR APPROVED BY CONTRACTING OFFICER. ACCESS MUST AVOID CUTTING MATURE TREES



SECTION - DEAD SLOUGH EXCAVATION AND DEAD SLOUGH LEVEE

STA. 12+00 TO STA. 8+00 CE
NO SCALE

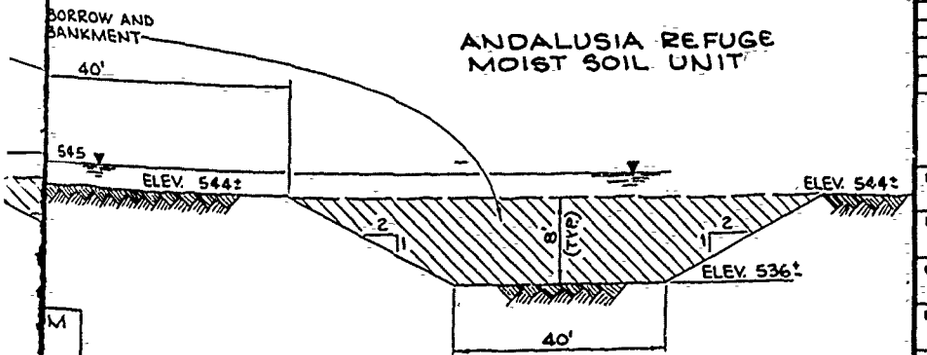
100' TRANSITION FROM STA. 11+00 TO STA. 12+00



100' TRANSITION FROM STA. 8+00CE TO STA. 9+00CE

SECTION - LEVEE

STA. 9+00 CE TO STA. 24+17.81 CE
NO SCALE



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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

SECTIONS I

Scale: As shown
Date:
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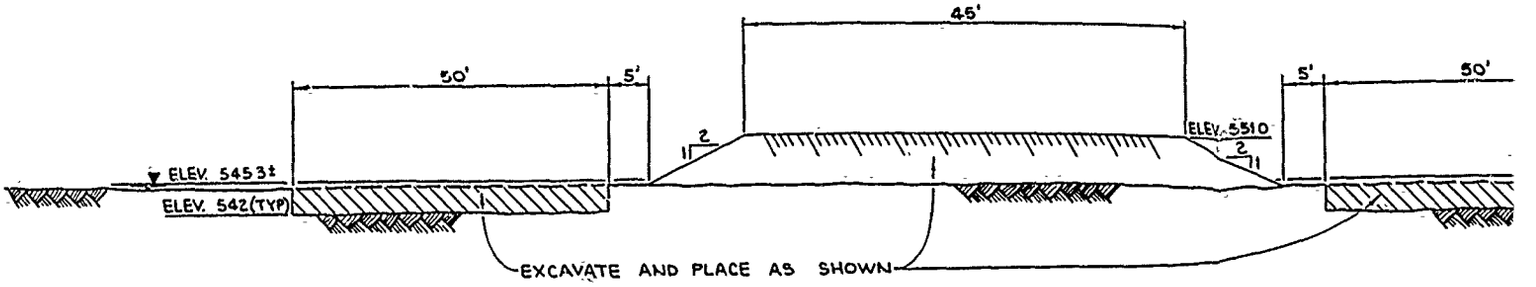
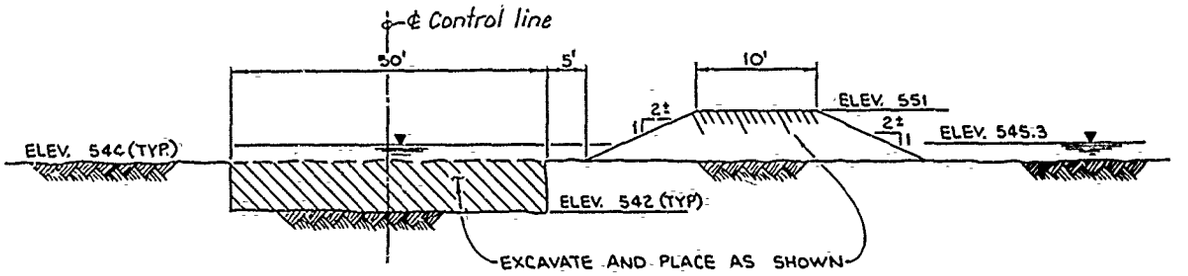
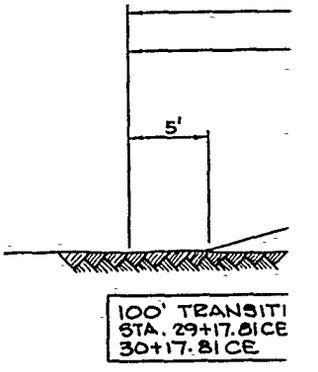
PLATE 18.



SECTION - REFUGE EXCAVATION TYPE I

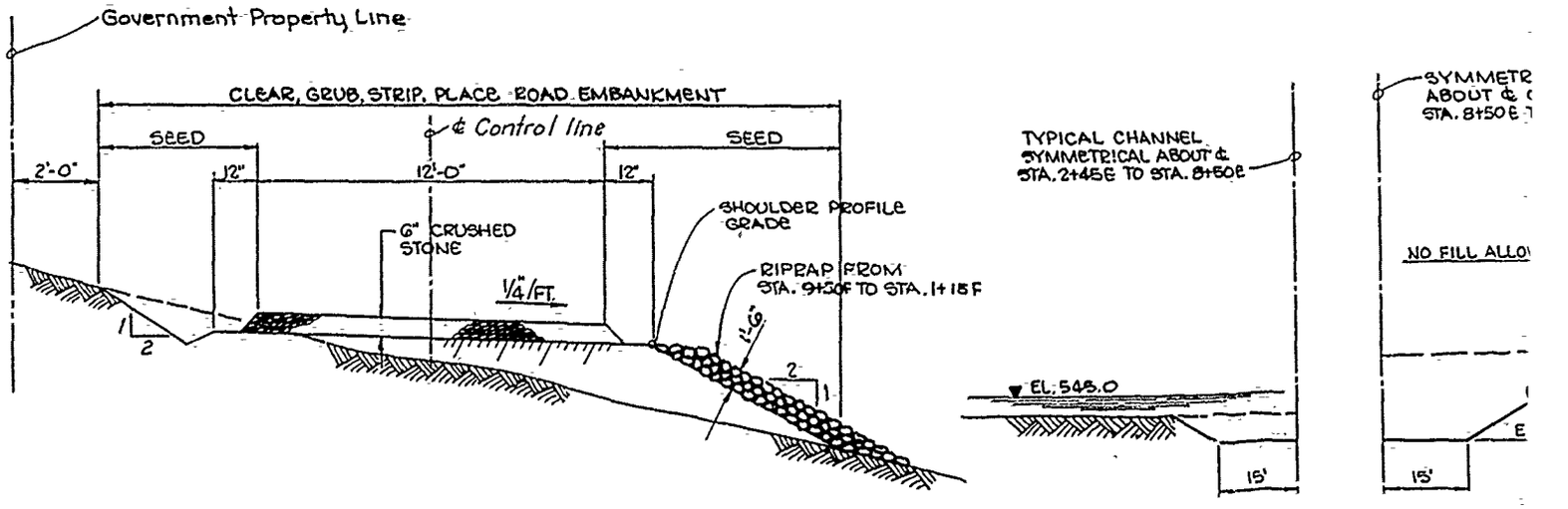
STA. 0+00D TO STA. 19+00D
STA. 34+00D TO STA. 43+00D
NO SCALE





SECTION - REFUGE EXCAVATION TYPE II

STA. 19+00D TO STA. 34+00D
STA. 43+00D TO STA. 50+45D
NO SCALE

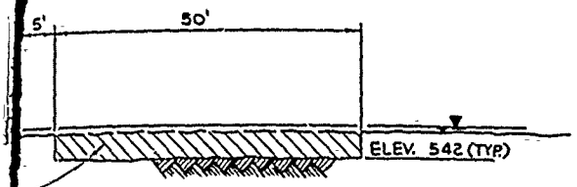


SECTION - ACCESS ROAD (TYP.)

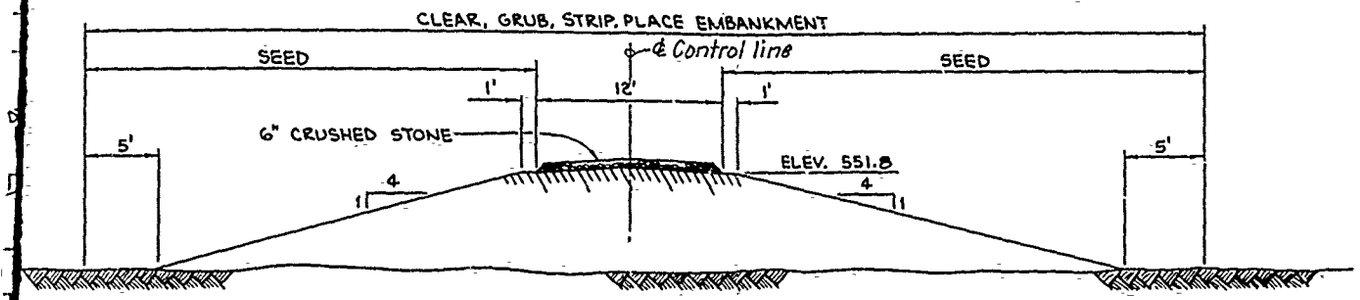
STA. 34+50 CE TO STA. 0+00 F
(NO SCALE)

SECTION

STA. 2+0



TYPE I

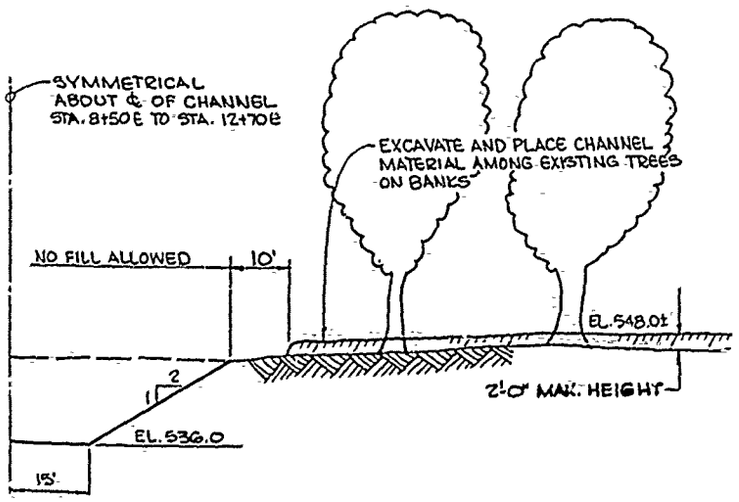


100' TRANSITION FROM STA. 29+17.81CE TO STA. 30+17.81CE

SECTION - LEVEE

STA. 30+17.81CE TO STA. 34+50 CE

0' 4' 8' 12' 16'



SECTION - RIVER ACCESS

STA. 2+48E TO STA. 14+00E
(NO SCALE)

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

SECTIONS II

Scale: As shown
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Sheet reference number:
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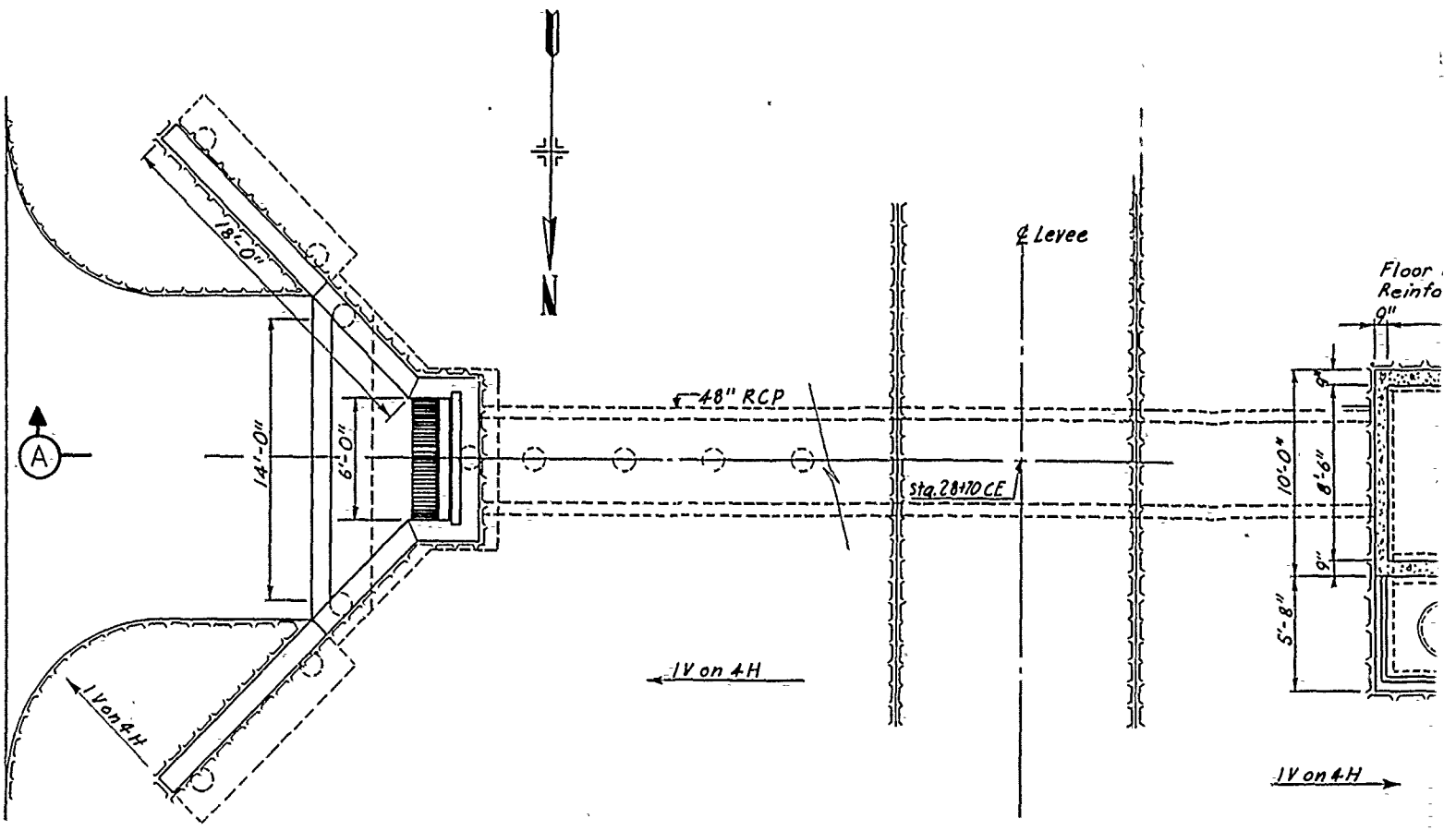
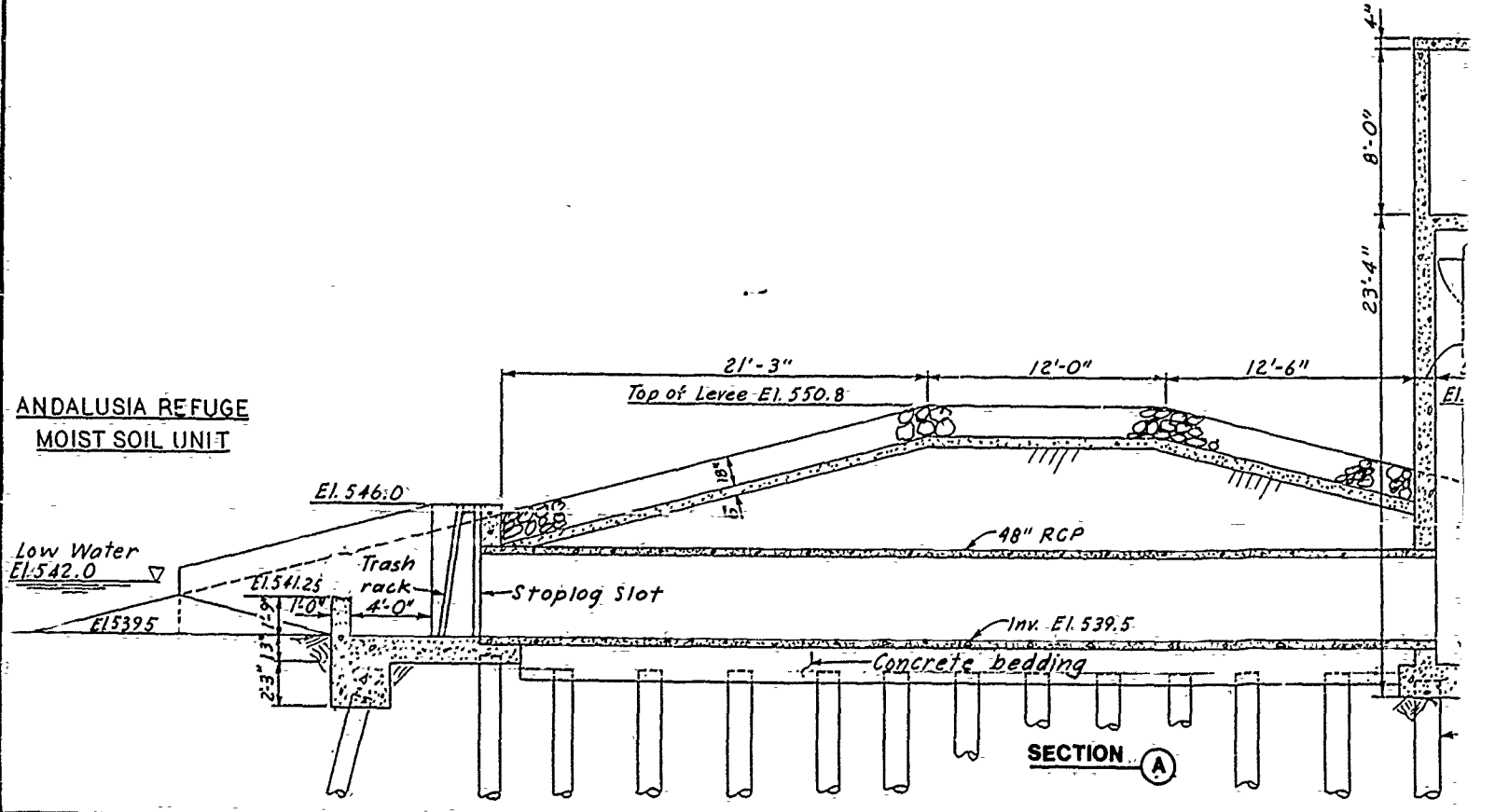
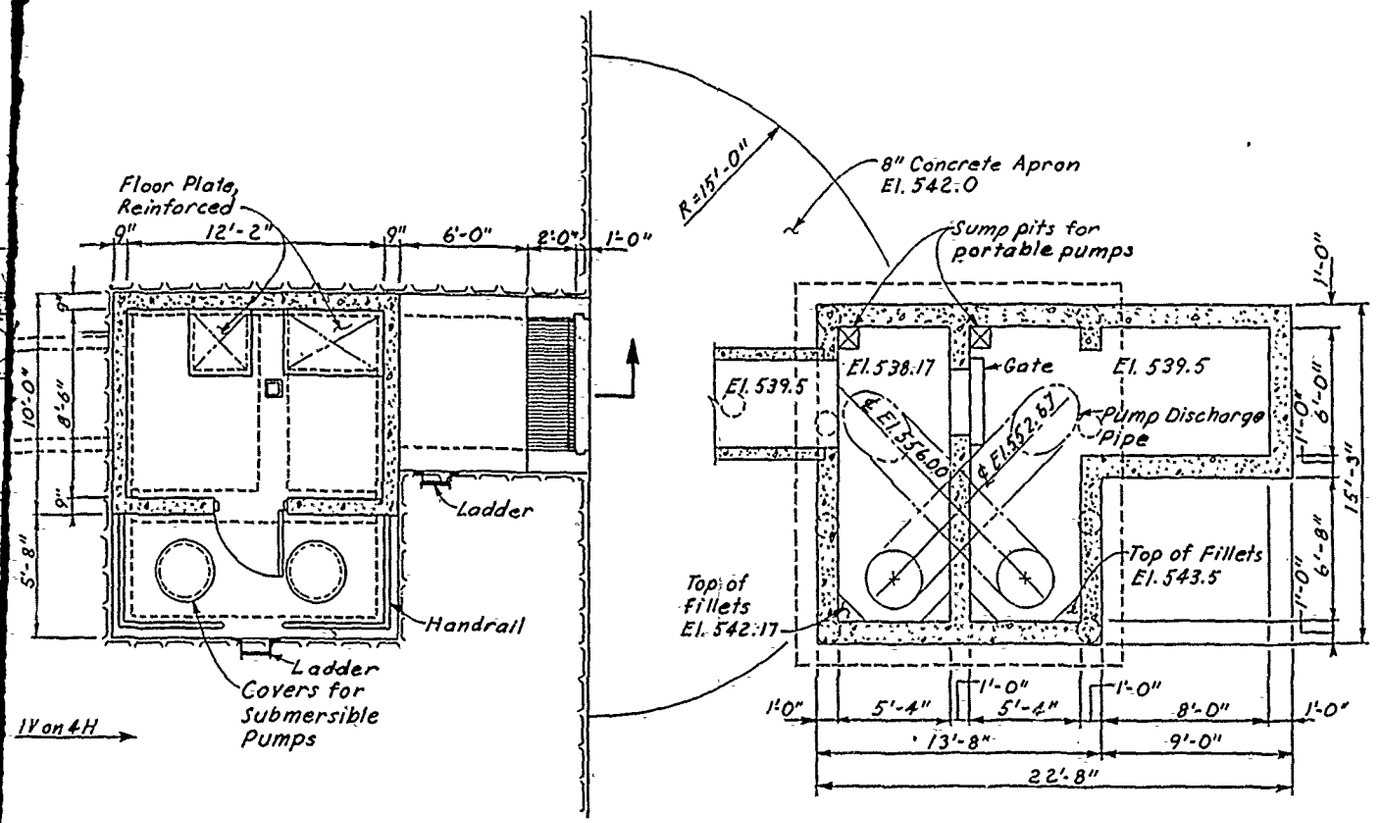
PLATE 19

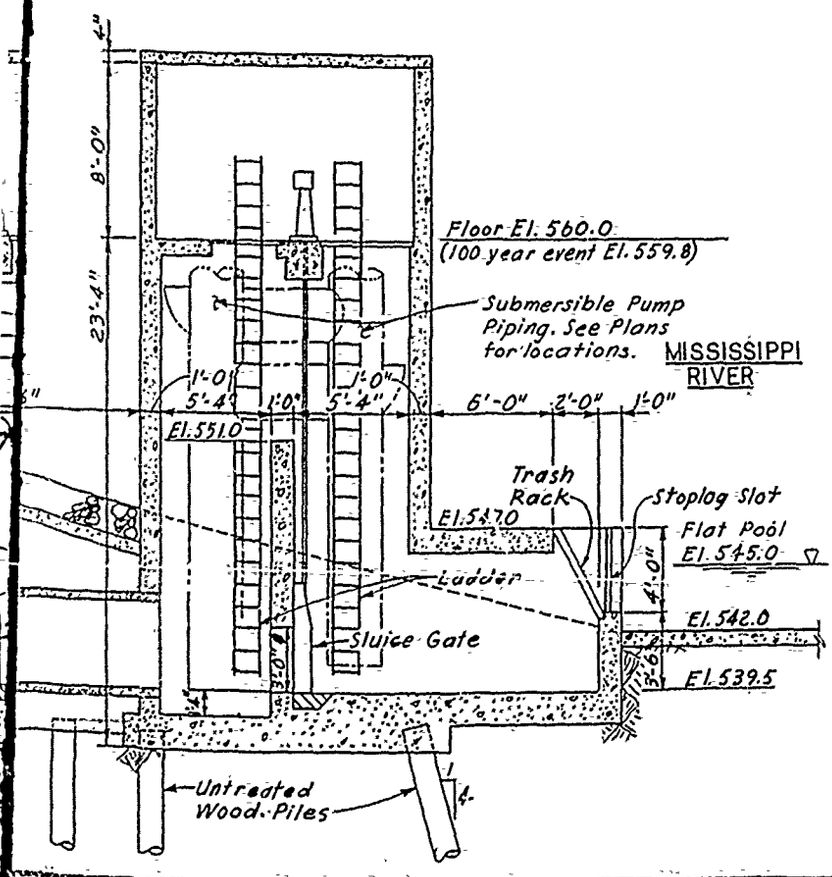

18'-0"
14'-0"
6'-0"
℄ 48" RCP
℄ Levee
Sta. 28+10 CE
1V on 4H
1V on 4H
1V on 4H
Floor Reinfo
9"
9"
10'-0"
8'-6"
9"
5'-8"

SITE PLAN


ANDALUSIA REFUGE
MOIST SOIL UNIT
21'-3"
12'-0"
12'-6"
Top of Levee El. 550.8
El. 546.0
Low Water
El. 542.0
El. 541.25
El. 539.5
Trash rack
4'-0"
1'-0"
Stoplog Slot
48" RCP
Inv. El. 539.5
Concrete bedding
8'-0"
23'-4"
4"
SECTION A



SUMP PLAN



0' 4' 8' 12'
SCALE

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

PUMP STATION

Scale: As shown
Date:
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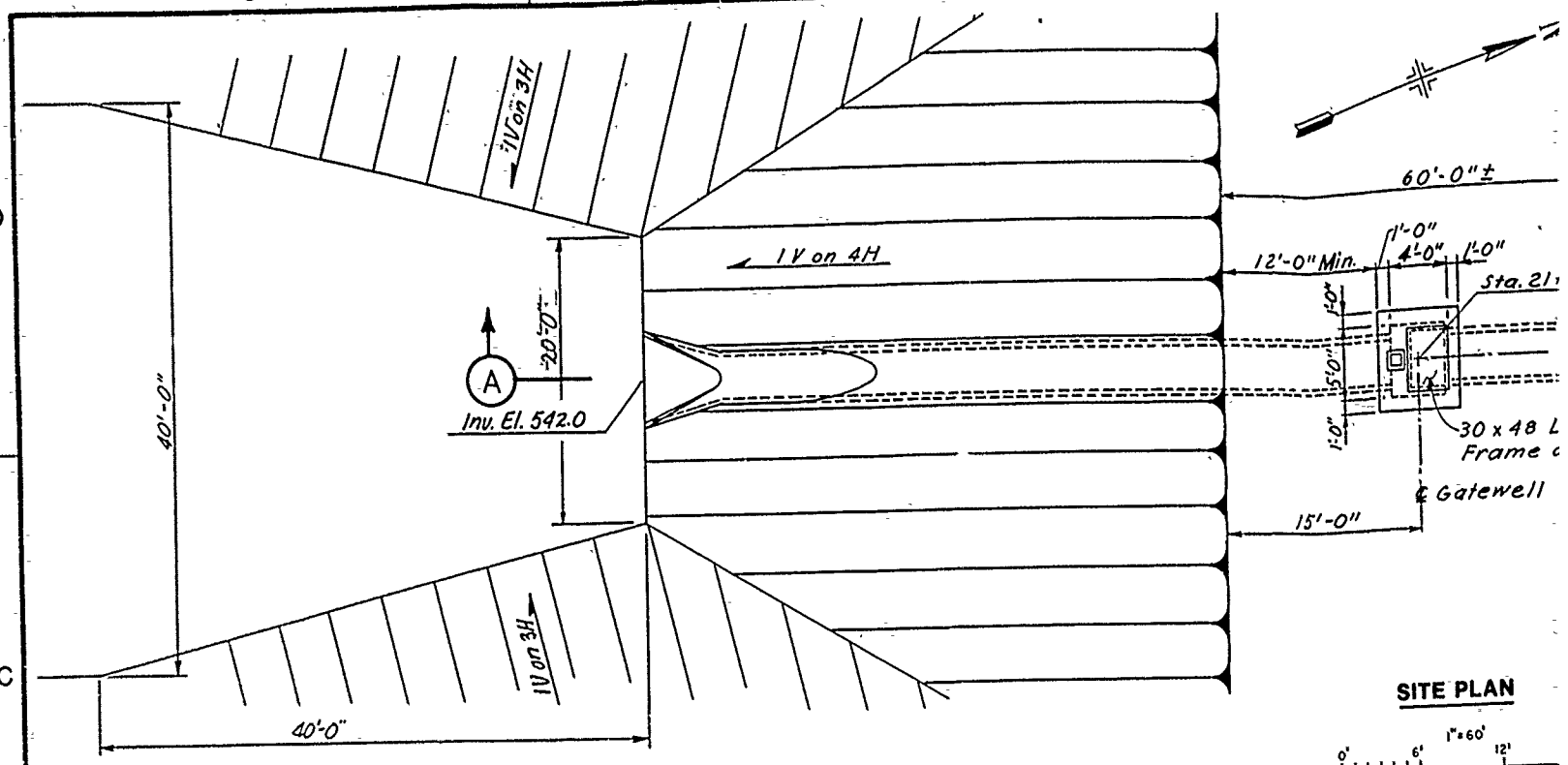
PLATE 20

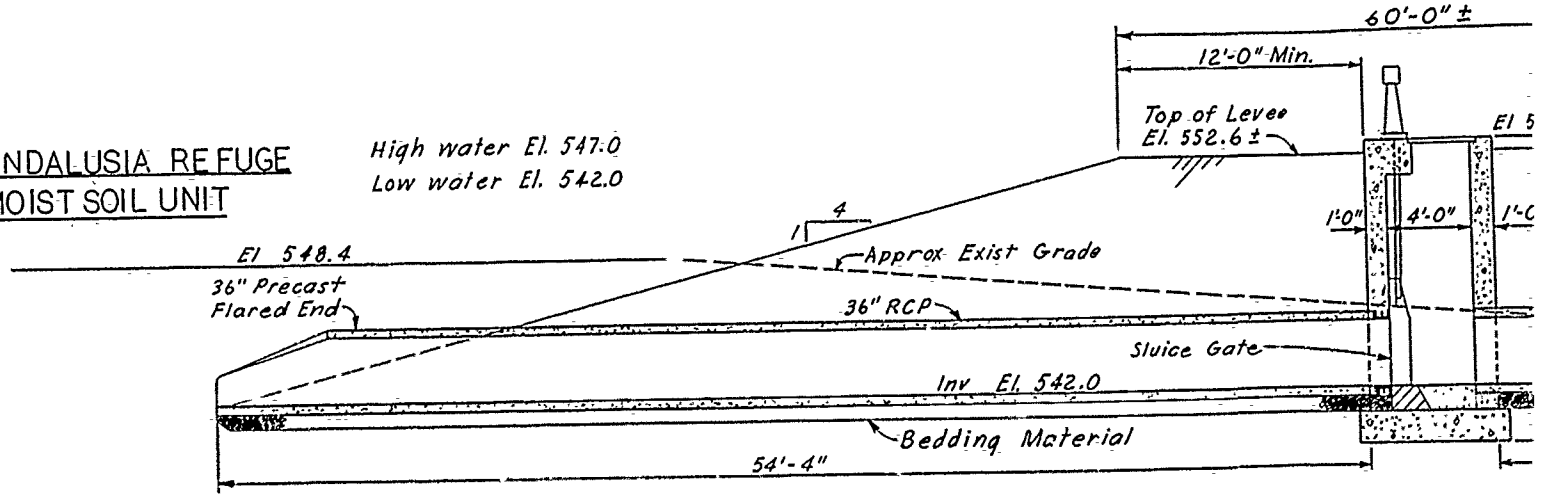


SITE PLAN

1"=60'
0' 6' 12'
SCALE

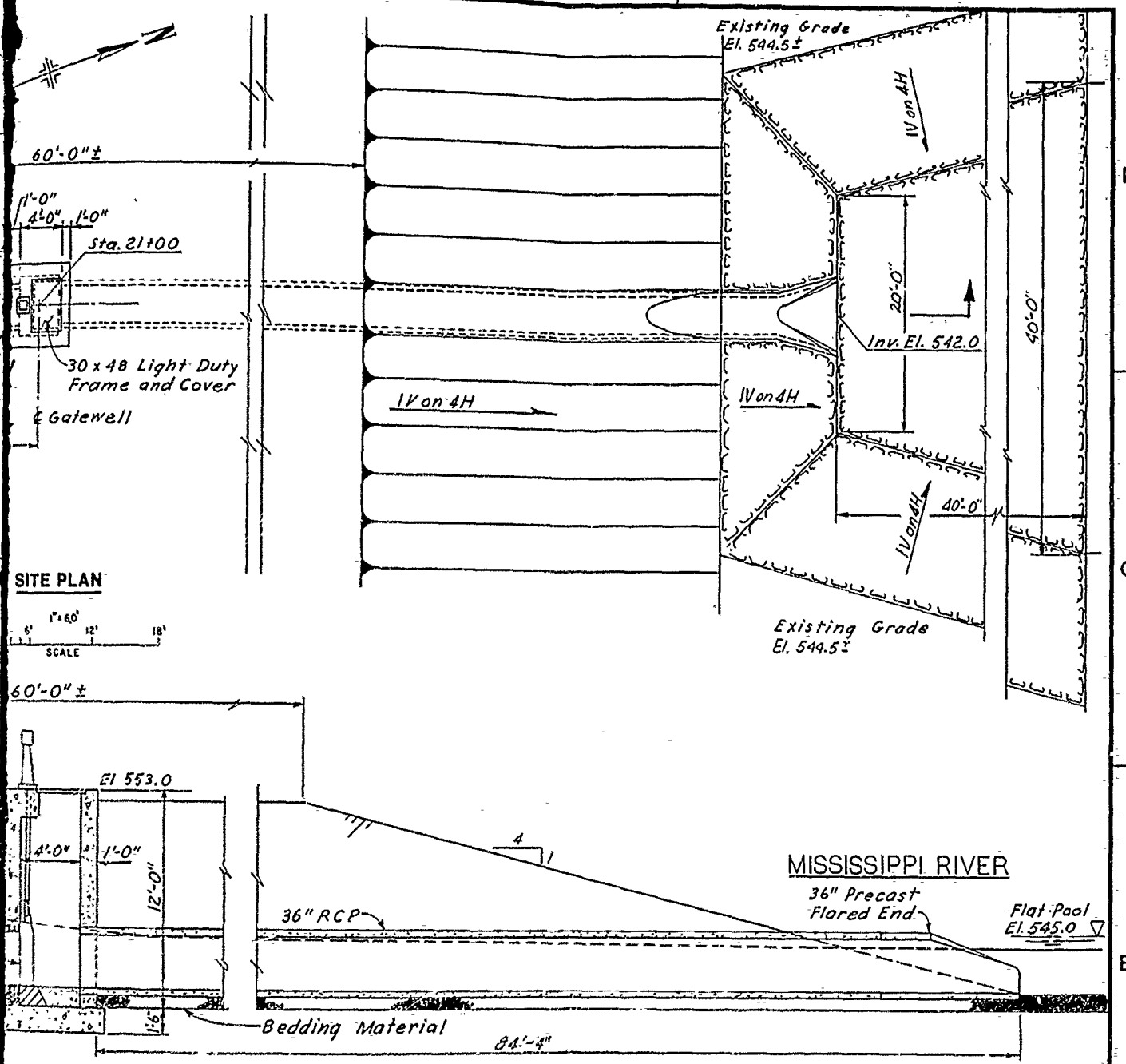
ANDALUSIA REFUGE
MOIST SOIL UNIT

High water El. 547.0
Low water El. 542.0



SECTION

SCALE: 1/4"=1'-0"
0' 4' 8'



SITE PLAN

1"=60'
6' 12' 18'
SCALE

SECTION (A)

SCALE: 1/4"=1'-0"
4' 8' 12'

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

WATER CONTROL STRUCTURE

Scales: AS SHOWN
Date:
Drawing Cycle:
Sheet reference numbers:
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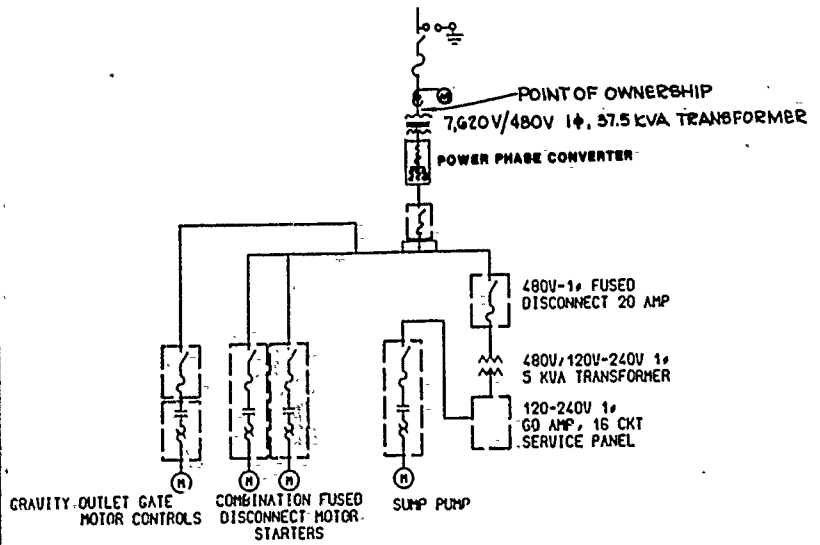
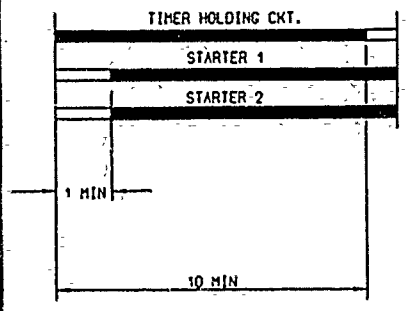
PLATE 21



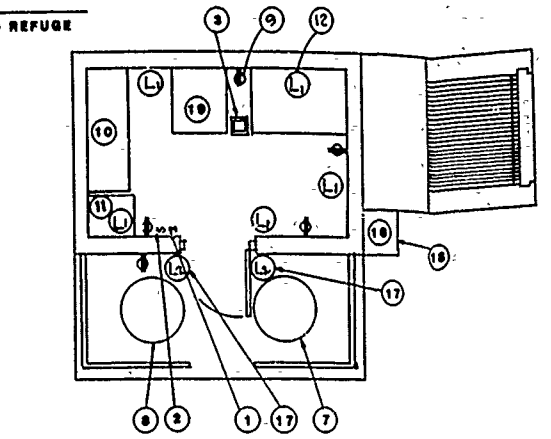
ONE LINE DIAGRAM OF PUMPING STATION POWER SERVICE

NOTE:
FUSED DISCONNECT SWITCHES FOR THE GATE OPERATOR MOTOR STARTERS TO BE IN THE CONTROL CENTER. THE MOTOR STARTER TO BE WITH THE GATE OPERATOR AND TO BE THE PROPER SIZE FOR THE MOTOR H.P. USED.



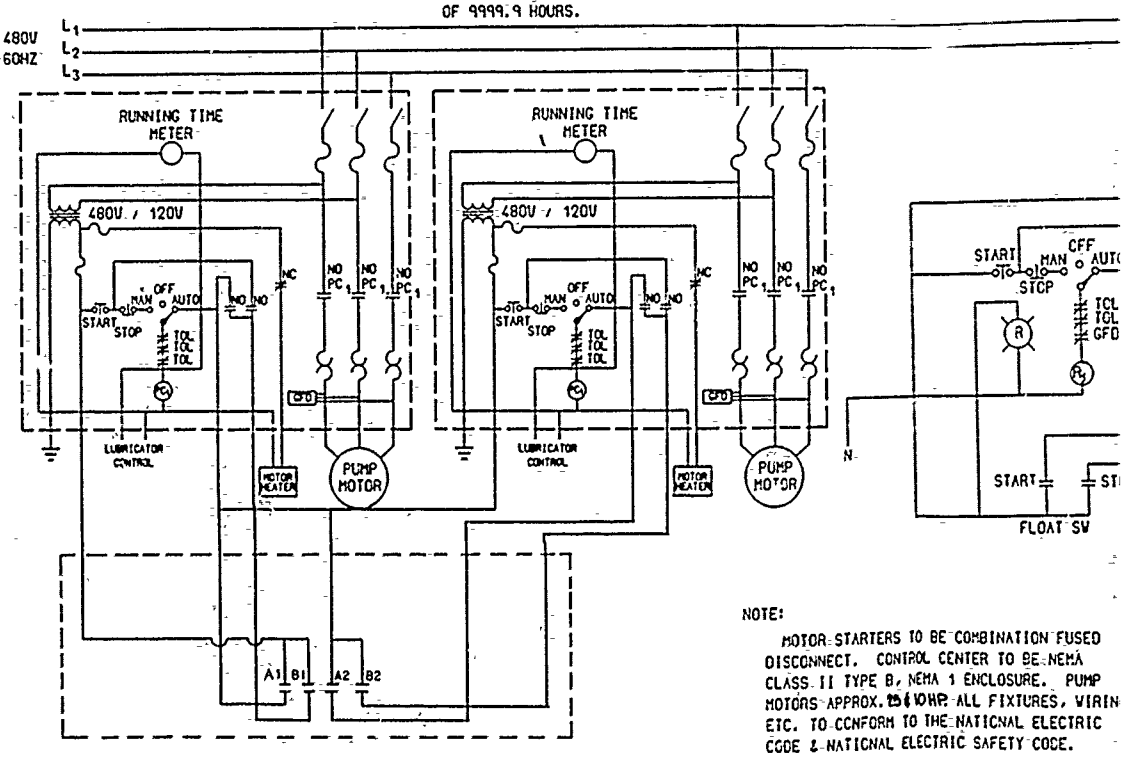
SEQUENTIAL STARTING TIME CHART

		START	STOP
FIRST PUMP	A	EL. 546.5	EL. 547.0
SECOND PUMP	B	EL. 542.5	EL. 542.0



ELECTRICAL EQUIPMENT PLAN

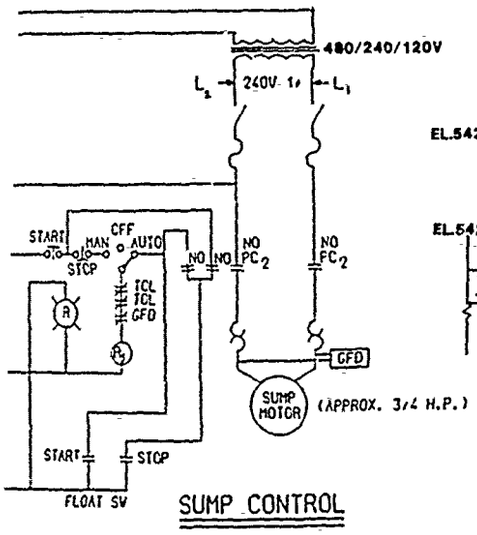
RUNNING TIME METER: DIGITAL TYPE SHOWING TOTAL HOURS AND 1/10 HOURS. MAXIMUM INDICATION OF 9999.9 HOURS.



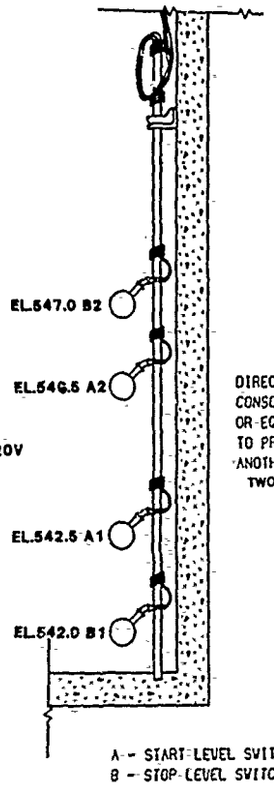
NOTE:
MOTOR STARTERS TO BE COMBINATION FUSED DISCONNECT. CONTROL CENTER TO BE NEMA CLASS II TYPE B, NEMA 1 ENCLOSURE. PUMP MOTORS APPROX. 25 HP. ALL FIXTURES, WIRING ETC. TO CONFORM TO THE NATIONAL ELECTRIC CODE & NATIONAL ELECTRIC SAFETY CODE.

SCHEMATIC DIAGRAM OF PUMP MOTOR STARTERS AND CONTROL

ITEM	DESCRIPTION	MANUFACTURERS DATA
1	LIGHT SWITCH	
2	SUMP LIGHT SWITCH	
3	GATE OPERATOR	
7	PUMP MOTOR	
8	PUMP MOTOR	
9	RECEPTACLE (6 REQ'D)	
10	CONTROL CENTER	
11	STEEL FILE CABINET (2 DRAWER)	
12	LUMINAIRE 150V VAPOR TIGHT (5 REQ'D)	
13	LUMINAIRE 150V VAPOR TIGHT (2 REQ'D, ONE FOR EACH SUMP)	
16	FLOAT SWITCHES	
17	PHOTO-ELECTRIC CONTROL-OUTSIDE LIGHTS	
18	WALL MOUNTED 150W HPS LIGHT (2 REQ'D)	
19	SUMP PUMP (240V-1φ)	



SUMP CONTROL



DIRECT ACTING FLOAT SWITCH CONSOLIDATED ELECTRIC CO. MODEL 9C OR EQUAL. FLOATS TO BE ORIENTED TO PREVENT INTERFERENCE WITH ONE ANOTHER. FLOAT B SHALL BE A TWO POLE DEVICE.

A - START LEVEL SWITCH
B - STOP LEVEL SWITCH

FLOAT SWITCHES

NOTES:

1. CONTRACTOR SHALL PROVIDE A 3" CONCRETE PAD UNDER THE CONTROL CENTER AND FILE CABINET. CONTROL CENTER TO BE TWO INCHES FROM WALLS.
2. PUMPS MAY BE RUN MANUAL START-AUTOMATIC STOP OR AUTOMATIC START-AUTOMATIC STOP.
3. LUBRICATORS SHALL BE WIRED TO OPERATE ONLY WHEN THE STORM WATER PUMPS ARE RUNNING.
4. INDICATOR LIGHTS, RED-OFF AND GREEN-ON, SHALL BE PROVIDED ON THE MCC FOR EACH STORM WATER PUMP.
5. SUMP PUMP TO BE EQUIPED WITH FLOATS FOR AUTOMATIC OPERATION. FLOATS SHALL BE SET AT STARTING EL. 539.5 AND STOPPING EL. 538.7 SUMP PUMP CAPACITY SHALL BE AT LEAST 120 G.P.M. AT 15FT. TDH.

COMBINATION FUSED
ENTER TO BE NEMA
1 ENCLOSURE. PUMP
2 ALL FIXTURES, WIRING
3 NATIONAL ELECTRIC
TIC SAFETY CODE.

AGRAM OF
STARTERS
TROL

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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

ELECTRICAL
ONE-LINE DIAGRAM

Scale:
Date:
Drawing Code:
Sheet reference number:
Sheet _ of _

PLATE 22

5
4
3
D
C
B
A
PRIN. MER
A
C
E

0 400 800 1200
SCALE

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ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16 RIVER MILE 462.7
ANDALUSIA SLOUGH

SEDIMENTATION AND
MONITORING PLAN

Scale

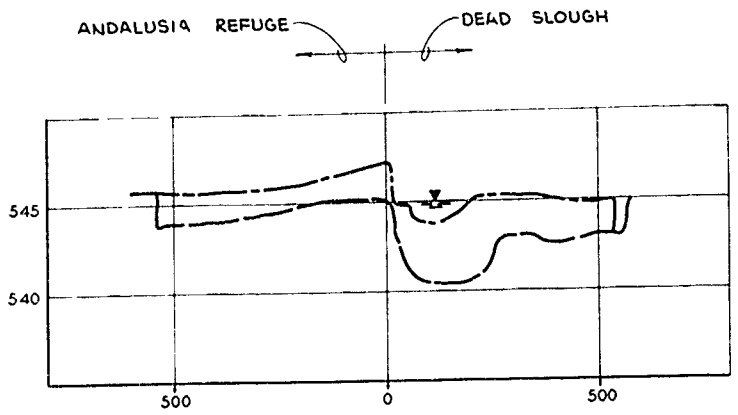
Date

Drawing Code

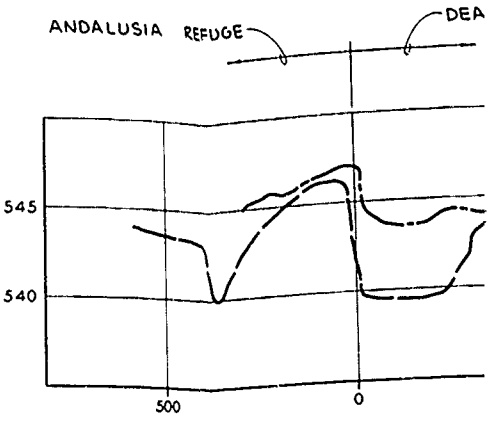
Reference number

Sheet ___ of ___

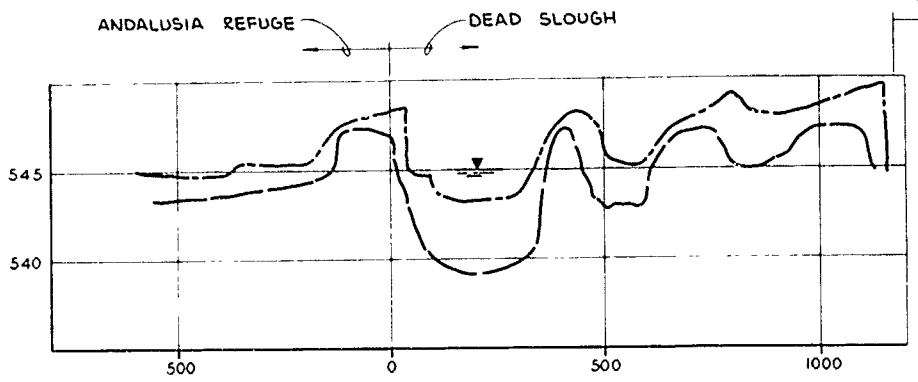
PLATE 23



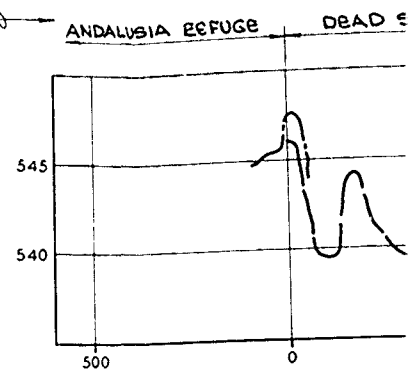
RANGE A STATION 15+50



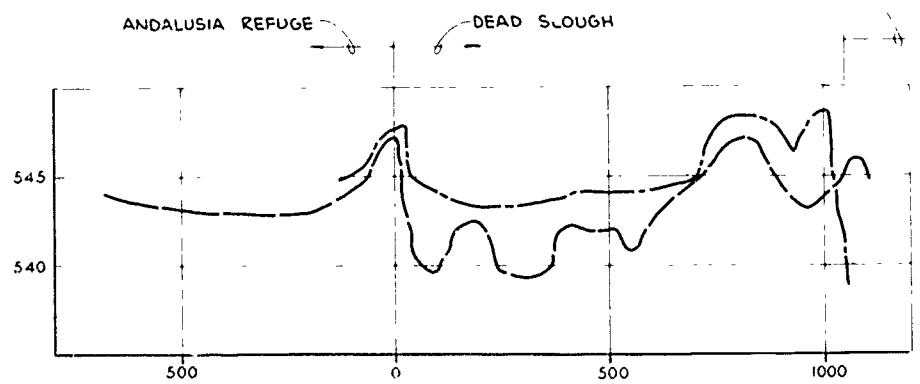
RANGE E STATION 45+75



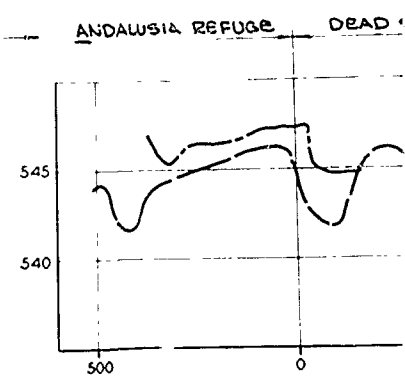
RANGE B STATION 23+75



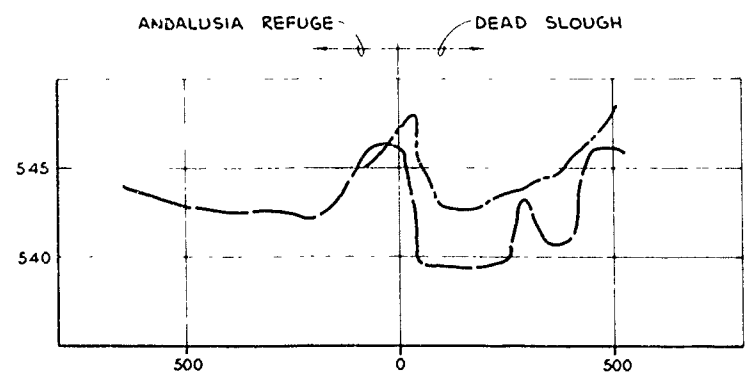
RANGE F STATION 2



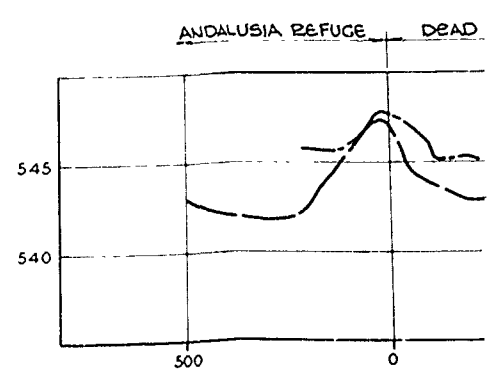
RANGE C STATION 30+75



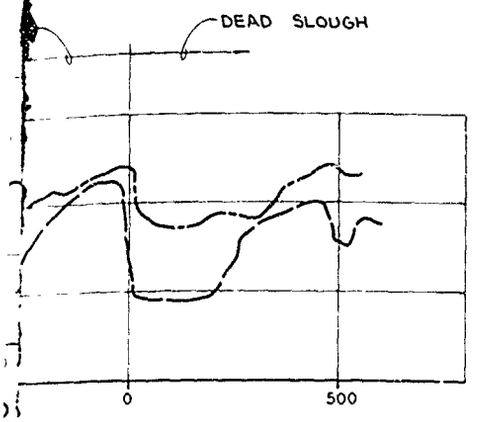
RANGE G STATION



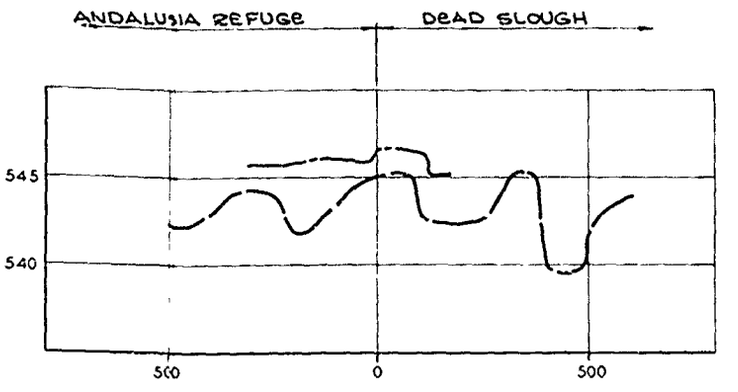
RANGE D STATION 38+25



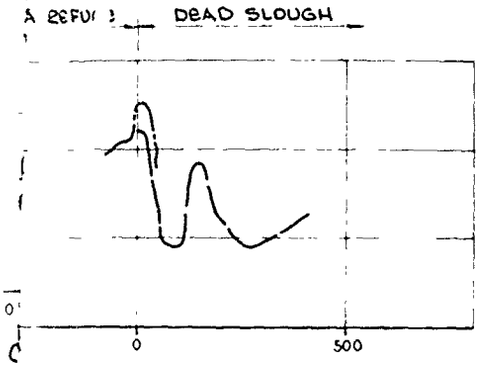
RANGE H STATION



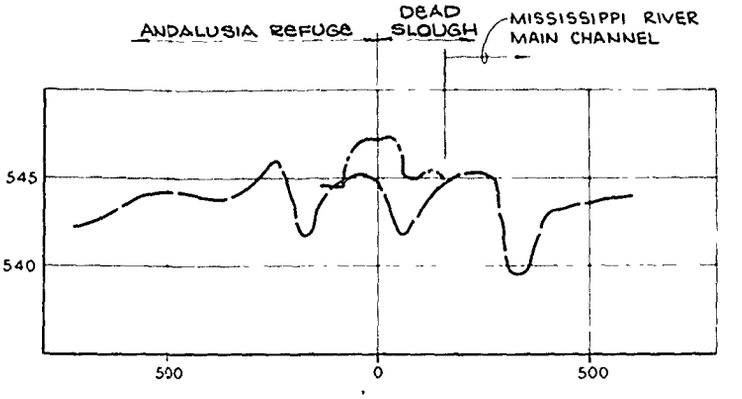
STATION 45+75 = 0+00 CE



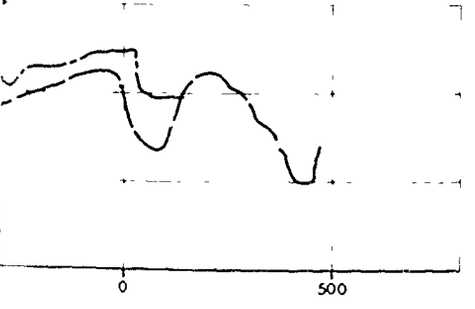
RANGE I STATION 12+70 CE



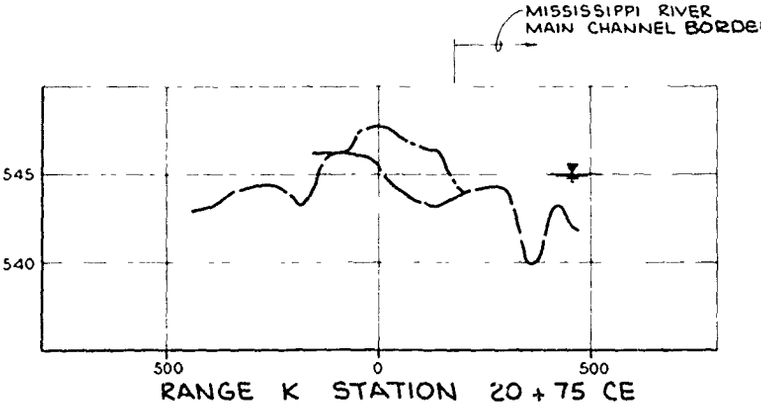
F STATION 2+72.15 CE



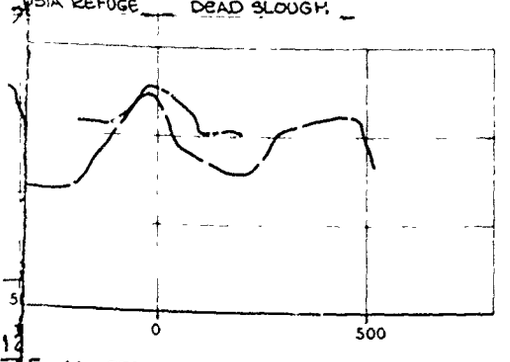
RANGE J STATION 16+76.26 CE



E G STATION 4+55.62 CE



RANGE K STATION 20+75 CE



E H STATION 8+88.12 CE

ELEVATION LEGEND:

- 1987, FIELD BOOK FC-87-9 AND FC-87-10
- 1936 PLANE TABLE, SHEETS 16-T-12 AND 16-T-13
- FLAT POOL ELEVATION 545.0

Revisions			
Symbol	Descriptions	Date	Approved

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
Drawn by:
Checked by:
Reviewed by:
Approved by:

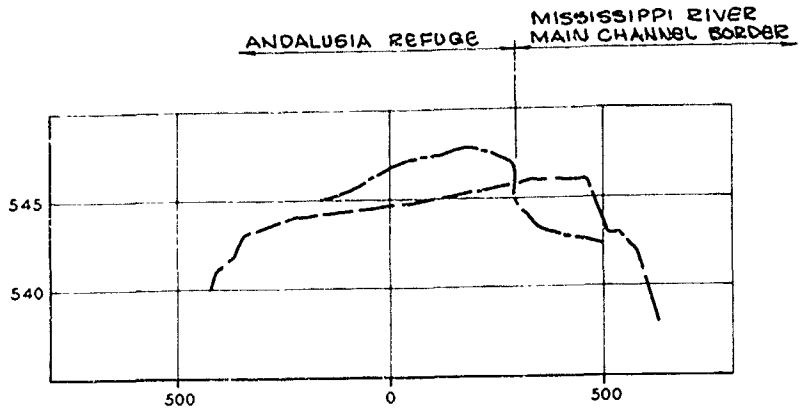
US Army Corps of Engineers

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

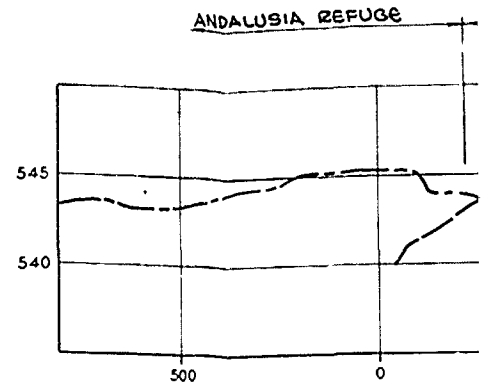
SEDIMENT RANGES A THROUGH K

Scale As Shown
Date
Drawing Code:
Sheet reference number
Sheet _ _ of _

PLATE 24



RANGE L STATION 8+00



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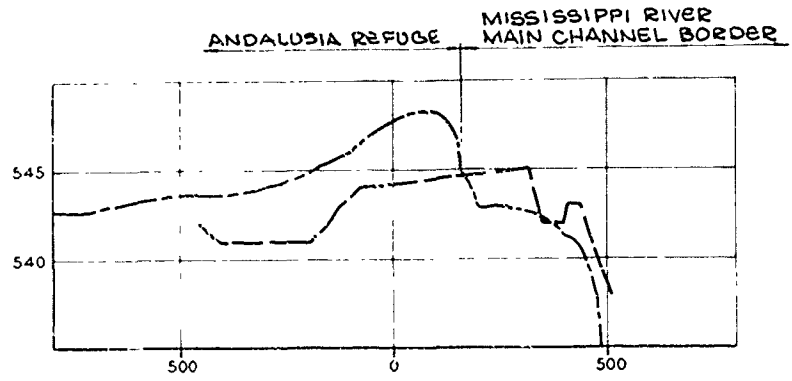
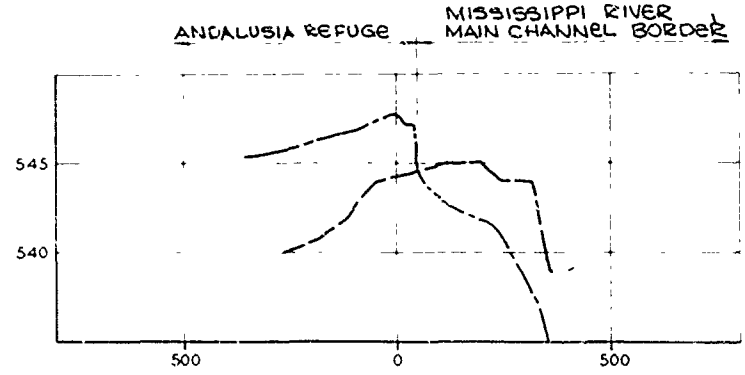
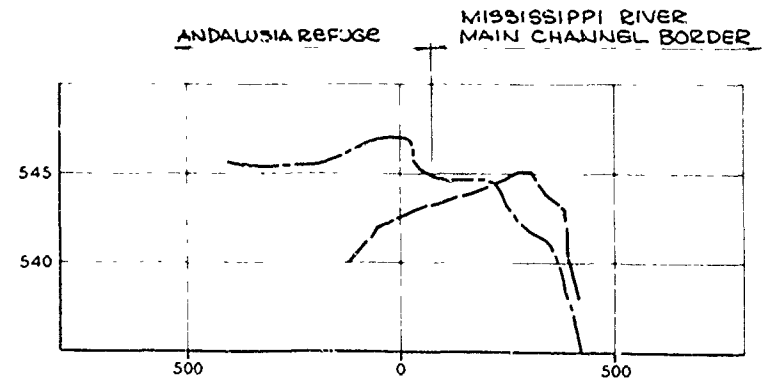


RANGE M STATION 16+00



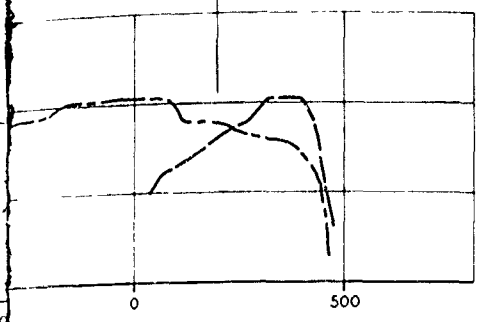
RANGE N STATION 24+00



RANGE O STATION 31+00

MISSISSIPPI RIVER
MAIN CHANNEL BORDER

LUSIA REFUGE



E P STATION 34 + 00

Revisions			
Symbol	Descriptions	Date	Approved

U S ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Designed by:
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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 16, RIVER MILE 462.7
ANDALUSIA SLOUGH

SEDIMENT RANGES
L THROUGH P

Scale: As shown
Date:
Drawing Code:
Sheet reference number:
Sheet _ of _

PLATE 25